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THE MONIST.

THE PRESENT STATE OF MATHEMATICS.*

THE German Government has commissioned me to communicate to this Congress the assurances of its good will, and to participate in your transactions. In this official capacity, allow me to repeat here the invitation given already in the general session, to visit at some convenient time the German University exhibit in the Liberal Arts Building.

I have also the honor to lay before you a considerable number of mathematical papers, which give collectively a fairly complete account of contemporaneous mathematical activity in Germany. Reserving for the mathematical section a detailed summary of these papers, I mention here only certain points of more general interest.

When we contemplate the development of mathematics in this nineteenth century, we find something similar to what has taken place in other sciences. The famous investigators of the preceding period, Lagrange, Laplace, Gauss, were each great enough to embrace all branches of mathematics and its applications. In particular, astronomy and mathematics were in their time regarded as inseparable.

With the succeeding generation, however, the tendency to specialisation manifests itself. Not unworthy are the names of its early representatives : Abel, Jacobi, Galois and the great geometers from

* Remarks given at the opening of the Mathematical and Astronomical Congress, at Chicago, Ill.

Poncelet on, and not inconsiderable are their individual achievements. But the developing science departs at the same time more and more from its original scope and purpose and threatens to sacrifice its earlier unity and to split into diverse branches. In the same proportion the attention bestowed upon it by the general scientific public diminishes. It became almost the custom to regard modern mathematical speculation as something having no general interest or importance, and the proposal has often been made that, at least for purpose of instruction, all results be formulated from the same standpoints as in the earlier period. Such conditions were unquestionably to be regretted.

This is a picture of the past. I wish on the present occasion to state and to emphasise that in the last two decades a marked improvement from within has asserted itself in our science, with constantly increasing success.

The matter has been found simpler than was at first believed. It appears indeed that the different branches of mathematics have actually developed not in opposite, but in parallel directions, that it is possible to combine their results into certain general conceptions. Such a general conception is that of the *function*, in particular that of the analytical function of the complex variable. Another conception of perhaps the same range is that of the *Group*, which just now stands in the foreground of mathematical progress. Proceeding from this idea of groups, we learn more and more to coördinate different mathematical sciences. So, for example, geometry and the theory of numbers, which long seemed to represent antagonistic tendencies, no longer form an antithesis, but have come in many ways to appear as different aspects of one and the same theory.

This unifying tendency, originally purely theoretical, comes inevitably to extend to the applications of mathematics in other sciences, and on the other hand is sustained and reinforced in the development and extension of these latter. I assume that detailed examples of this interchange of influence may be not without various interest for the members of this general session, and on this account have selected for brief preliminary mention two of the papers which I have later to present to the mathematical Section.

The first of these papers (from Dr. Schönfliess) presents a review of the progress of mathematical crystallography. Sohncke, about 1877, treated crystals as aggregates of congruent molecules of any shape whatever, regularly arranged in space. In 1884 Fedorow made further progress by admitting the hypothesis that the molecules might be in part inversely instead of directly congruent. In the light of our modern mathematical developments this problem is one of the theory of groups, and we have thus a convenient starting-point for the solution of the entire question. It is simply necessary to enumerate all discontinuous groups which are contained in the so-called chief group of space-transformations. Dr. Schönfliess has thus treated the subject in a text-book (1891) while in the present paper he discusses the details of the historical development.

In the second place, I will mention a paper which has more immediate interest for astronomers, namely, a *résumé* by Dr. Burkhardt of "The Relations Between Astronomical Problems and the Theory of Linear Differential Equations." This deals with those new methods of computing perturbations, which were brought out first in your country by Newcomb and Hill; in Europe, by Gylden and others. Here the mathematician can be of use, since he is already familiar with linear differential equations and is trained in the deduction of strict proofs; but even the professional mathematician finds here much to be learned. Hill's researches involve indeed,—a fact not yet sufficiently recognised,—a distinct advance upon the current theory of linear differential equations. To be more precise, the interest centres in the representation of the integrals of a differential equation in the vicinity of an *essentially* singular point. Hill furnishes a practical solution of this problem by the aid of an instrument new to mathematical analysis,—the admissibility of which is, however, confirmed by subsequent writers,—the infinitely extended, but still convergent, determinant.

Speaking, as I do, under the influence of our Göttingen traditions, and dominated somewhat, perhaps, by the great name of *Gauss*, I may be pardoned if I characterise the tendency that has been outlined in these remarks as a *return to the general Gaussian programme*. A distinction between the present and the earlier period

lies evidently in this: that what was formerly begun by a single master-mind, we now must seek to accomplish by united efforts and coöperation. A movement in this direction was started in France some time since by the powerful influence of Poincaré. For similar purposes we three years ago founded in Germany a mathematical society, and I greet the young society in New York and its Bulletin as being in harmony with our aspirations. But our mathematicians must go further still. They must form international unions, and I trust that this present World's Congress at Chicago will be a step in that direction.

FELIX KLEIN.

CORRELATION OF MENTAL AND PHYSICAL POWERS.

THE popular judgment as to the compatibility, or otherwise, of mental and physical superiority, tends, broadly speaking, towards one or other of two diametrically opposed conclusions. The old-fashioned view was that excellence in one of these directions almost certainly implied deficiency in the other. The successful hard-reading student was, it was taken for granted, a poor thing in respect of his body. His running was good for little, his jumping was worth nothing. He had chosen a career, which, whatever it might promise in the way of future or posthumous fame, was sure to give him, for his portion in this life, weak eye-sight, a narrow chest, and feeble muscles. Against this view, another and quite opposite one found considerable acceptance in many quarters. The "muscular Christian," as he came to be called, after Kingsley had represented him to us, combined a very superior mind in a very sound body. There was nothing new in such a view, and those who like broad generalisations may declare that it was the reassertion of the Greek way of looking at man, in opposition to the clerical or mediæval way. Anyhow, it was assumed that the large-limbed hero was sure to be found high up in university class lists; and that if any youth left college, after three years' residence, running and jumping no better than when he came, it was only too likely that his tutor would be found to be as dissatisfied with his career as his trainer could have been, had he been provided with one.

So long as we confine ourselves to advancing individual instances, or to proving our generalisations by portraying characters

in works of fiction, both of these views have plenty to say for themselves, and against each other. Quite recently, however, some statistics have been collected upon the subject, which, whatever their deficiencies, have at least the merit of attacking the problem in the only way in which anything resembling a solution can be hoped for. Some years ago Mr. F. Galton, to whose ingenuity and industry so many branches of statistics are much indebted, started an Anthropometric Laboratory at South Kensington, London, during one of the large exhibitions held there. In the course of the year many thousand sets of measurements were obtained ; but they had the drawback, which every statistician will recognise, that they were drawn from rather heterogeneous data. Men and women were alike dealt with, and these differed widely in age, social position, and previous bodily development ; whilst the application of any mental test was quite out of the question. Another laboratory, therefore, of the same kind was started at Cambridge, where, as we shall soon see, most of these drawbacks were either absent or much reduced in importance.

As regards the physical tests, little need be said here, as they are mostly of a familiar kind. They dealt with the seven following particulars : (1) Eye-sight, i. e., the distance at which small "diamond type" print could be read with each eye separately. (2) Strength of pull, as in the action of drawing a bow ; this was measured in pounds. (3) Strength of squeeze, with each hand separately. The instrument here had two handles at a few inches' distance apart, which were squeezed together against the action of a spring. The pressure exerted was measured in pounds. (4) The height (without shoes) measured in feet and inches. (5) The breathing capacity, measured by a spirometer. The number of cubic inches which could be exhaled, after taking a deep breath, was thus recorded. (6) The weight, in pounds, taken in ordinary in-door costume. (7) To this was added the measurement of the head in three directions at right angles to each other. The product of these three elements gave, on the average, a number proportional to the volume of the head. For brevity, this product has been here termed the "head volume."

As regards these physical tests, little explanation is needed, as they are familiar to most students of statistics, and some of them have been applied on a vastly more extensive scale than anything now to be described. The only points that need present notice is the *homogeneous* character of our data. The students at the English universities are mainly drawn,—as they have been since the time of the Reformation at any rate,—from what are commonly called the upper classes. That is, nine out of ten of them are the sons of country gentry, professional men, and well-to-do tradesmen. Physically speaking, they have generally been made the most of; since they, and their fathers before them, have been duly fed and clothed and exercised. There is, consequently, none of the irregularity of result which may be observed sometimes in statistics dealing with army recruits, when immature youths are suddenly put, for the first time in their lives, into a position really favorable to physical growth. As regards the homogeneous character of the human materials here dealt with, every statistician will realise its importance. A comparatively small number of accurate observations, applied to a well-defined class, will often outweigh in value a vastly greater number which have been drawn from a medley of various classes.

So much for the merely physical tests. Such novelty, however, as there is in our present results lies mainly in the attempt to bring some kind of mental test into correlation with the physical. I need hardly insist upon the difficulty of such a task. Many people think they understand as clearly what they mean by an "able" man, as by a strong or a tall man. Perhaps they do; but they soon find that every one else understands it just as clearly as they do themselves, and with a totally different result. The first-class orator, preacher, or poet in one judgment is plucked without question in another. In an elaborate indictment of the *Cambridge Mathematical Tripos*, made some years ago, the critic asserted, amongst other objections, "that the best man invariably came out second." This was not quite true; but if it had been, did it cross the writer's mind what sort of an upheaval of the foundations of society would result

from a determined attempt to hoist the best man in each department of life as near the top as that?

In a much examined university,—and perhaps nowhere else,—it does become possible to arrange and classify men with regard to their mental powers. There is, of course, no question here of taking an arithmetic mean, and it was not even attempted to arrange the men in order of merit. All that was done was to group them into three classes, respectively denoted here as *A*, *B*, and *C*. In *A* are included all those who attain a first class in any honor examination, or who secure a college scholarship. *B* comprises all the rest of the men who pass in honors, that is, the second and third-class men in their various examinations. *C* comprises all who merely pass for their degree, or try to do so and fail. What with the multitude and varied scope of modern examinations, and the intimate knowledge of the capacities and attainments of their pupils possessed by most of the tutors, there was no great difficulty found in grouping the students in this way. I am well aware of the objections which may be raised. It is not for a moment claimed that such a classification is perfect, even within the modest limits at which it aims. Able men may fail in the class lists through indolence or ill-health, as inferior ones may succeed through luck or drudgery. But it must be remembered that we only profess to deal with averages, not with individuals, and on averages such influences have little power of disturbance. There are probably few cricket or foot-ball clubs in which one or more men in the second eleven or fifteen may not be really better than some in the first; but what chance would the second team have of beating the first? If we were selecting an individual as a tutor or secretary, it would be folly to prefer an *A* to a *B*, without further inquiry; but to weigh groups against each other is a very different matter. All that is here maintained is that our *A*, *B*, *C* classes, *as classes*, stand out indisputably distanced from each other in respect of their intellectual capacity. Not only is the average superiority of one group over the next patent to all who know the men, but we may safely say of them, what could perhaps be said nowhere else, that if the men had to vote themselves into three such

classes, the results would not be very different from what were obtained by the tests actually employed.

Before proceeding to our main subject of comparison, there is one remark which I should like to make in reference to the physical tests. These were made in six specified particulars, the choice of these particulars being partly decided by the facility of prompt and accurate determination. It may fairly be inquired whether these are isolated characteristics, in the sense that preëminence in one of them carries no superiority in the others. If this were so, their significance would be much diminished, for the testimony of one of them would not corroborate that of the others. The tall men might tend to be stringy, the heavy ones to be puffy, and the man with great capacity for expiration might, so to say, have sacrificed the muscles of his sword-arm in order to devote himself to the peculiar duties of a trumpeter. The exact extent to which decisive superiority in one physical characteristic is thus associated with comparative superiority, or otherwise, in respect of other characteristics, has not, as far as I know, been previously investigated, and it is therefore worth while to give some statistics on the subject. The general conclusion we find to be that the man who is very good in any one direction physically, is distinctly above the average in all the other directions. The most striking proof of this fact is arrived at as follows: Conceive a selection made of "the best in ten." If there are a thousand, select the hundred best; if, as in the Cambridge statistics, there are about three thousand, select the three hundred best. This is, of course, to make a high demand. It was found, for instance, that this bodily "first-class man" was, in respect of height, six feet or upwards; in respect of breathing he could expire three hundred and five cubic inches; his minimum pulling strength was one hundred pounds; his "squeeze," with his strongest hand, was also about one hundred pounds. The test for his eye-sight required that, with each eye separately, he could read the small print employed at a distance of at least thirty-four inches. The following table gives a summary view of the results of comparing the various classes; each of these being selected, of course, for eminence in one quality only.

FIRST CLASS.	EYES.	PULL.	SQUEEZE.	BREATHING.	HEIGHT.	WEIGHT.
Eyes.....	34.7	87.5	84.3	265.3	69.41	157.1
Pull.....	25.6	112.3	94.1	282.9	69.98	167.7
Squeeze.....	24.5	95.7	102.3	279.8	70.41	169.2
Breathing.....	24.8	93.8	91.4	321.0	71.34	168.1
Height.....	24.6	88.3	89.2	291.0	73.31	170.8
Average student ..	23.6	83.0	83.4	255.4	68.91	153.3

The meaning of this will be readily understood. Thus the men comprising our first class in respect of their pulling power (the minimum requirement being one hundred pounds) can, on an average, read at a distance of 25.6 inches; can, on an average, pull 112.3 pounds, and so on. The result is, I think, rather remarkable, for it is seen that great superiority in any one direction implies decided superiority in every other direction. That some of these capacities should be thus correlated is only what we should expect; it would be thought strange, for instance, if pulling and squeezing power did not go together, or height and weight. But one could not with equal confidence have anticipated that the taller men should have distinctly better eye-sight; or that the men selected solely for their superior eye-sight should have decidedly better muscles for pulling purposes, and stand half an inch taller than the average. The reader must not underrate the significance of the apparently small differences with which we are concerned. We are dealing with the averages of large numbers; large enough to make a difference of half an inch of stature utterly unaccountable as a mere coincidence.

This extent of correlation of physical powers seems to me to add considerably to the value of our tests. It meets the objection that we have no right to assume that the tall man, or the man with muscular arms, is in the widest sense of the term a physically robust or strong man. If we find that four or five perfectly independent tests all point in the same general direction, we have some ground for supposing that the qualities thus tested are *not* independent, but that they are integral components in the building up of the generally healthy and powerful man.

As regards the comparison of the intellectual and the physical arrangements of our men, the simplest plan is to give at once a summary table of the results.

	NUMBER TESTED.	EYES.	PULL.	SQUEEZE.	HEAD.	BREATH-		
						ING.	HEIGHT.	WEIGHT.
A	674	22.9	81.8	83.4	243.82	256.5	68.81	153.0
B	1370	23.7	82.8	83.2	238.34	255.7	68.98	152.5
C	1138	23.9	84.1	83.6	236.44	254.5	68.88	154.2

Such a table as this may be examined with two different degrees of minuteness in respect of the appreciation of differences ; which would commonly be called the practical and the theoretical way of regarding them. By the former, speaking in the more accurate language of statistics, we may understand a degree of precision which does not recognise distinctions of less than about four or five per cent. of the totals involved. Looked at with this degree of nicety, the main fact that the tables yield is that there is really no difference between the physical characteristics of the different intellectual grades. Whether in respect of height, weight, power of squeeze, eye-sight, breathing capacity, or head-dimensions, one class is just about as good as another. The trifling existent differences tell sometimes one way and sometimes the other, and appear, to the eye of the plain man, well within the scope of accident. There are, indeed, three points about which some doubt might be felt, viz., the size of the head, the pulling power, and the eye-sight. The first of these is of sufficient importance to be reserved for special examination, and will be subjected presently to a severer test. The two latter are just the sort of differences as to the significance of which the untrained mind is troubled with a doubt. The high-honor men show a trifling inferiority of eye-sight, it is true ; but the diminution does not, so to say, step on uniformly through the three classes, A, B, C. On the other hand, the falling off in strength of pull, though no larger in amount, does seem to keep step somewhat better.

The matter is worth looking at a little closer from a slightly different point of view. Revert to the physical distribution of the men, described already, in accordance with which they were grouped into ten classes ; and select the top class, which comprises "the best in ten." They are, in each separate department, about three hundred in number. We may then inquire, in respect of these exceptionally

vigorous men. How are they distributed as regards *A*, *B*, *C*? We know in what proportions they ought to be distributed, by mere chance, or if their bodies and their minds had, so to say, nothing to do with each other: are the proportions actually found to prevail, very different from this? The answer is that, as regards eye-sight, any doubt which we felt at first may now be considered as much weakened, if not set aside. The most perfect powers of vision which our test can furnish are very nearly as likely to be found amongst the hard-reading and high-honor men as amongst the idlest. The total number of this first class in respect of sight was 302. The distribution of them into *A*, *B*, and *C* that would have been expected if the qualities were quite independent is 64, 130, and 108: the actual distribution is 61, 140, and 100, a very trifling difference. It is quite clear that, taken as a whole, our studious men do not overstrain their eyes. As regards the pulling power, the decision yielded by this method tells the other way; and suggests that, for one reason or another, hard reading and hard pulling are slightly, though only very slightly, incompatible. The figures are these. Our first class here contains 289 men. If these had been drawn at random out of the *A*, *B*, *C* classes, we should have expected these three classes to furnish respectively 61, 124, and 104. As a matter of fact they furnish, 41, 119, and 129. Such a difference as this, then, indicated by one kind of evidence and confirmed by a slightly different kind, cannot be regarded as accidental. Why is it that the hard-reading men, who are just as well developed in general respects,—who stand as high, weigh as heavy, and have equally clear eyes and sound lungs, and can even squeeze as hard with the muscles of the hands,—why is it that they show a small but distinctly marked deficiency in the particular action of pulling at a bow? The only reason which seems at all plausible is that though these men take abundantly sufficient out-door exercise to develop their *general* capacities, they, or a considerable minority of them, do not so largely practice certain athletic exercises which strengthen the muscles in question. In other words, they are presumably less addicted on the whole to rowing, cricket, and tennis. One would not have thought it was so, speaking from a general knowledge of their habits; but

it certainly seems as if this was the only probable explanation of the undoubted facts of experience.

The foregoing conclusions are, I think, the most important which could safely be drawn by the practical man who judges the statistics as they stand ; that is, without resort to any of the tests which theory can offer for our help. When we resort to this aid we are able to give a satisfactory answer to the question whether the reading men, as a rule, have bigger heads. On the face of the matter it is clear that they do, so far as these statistics extend. Moreover there is a successive advance of size from *C* to *B*, and from *B* to *A* ; and also, what does not appear from the only tables we can find space for here, the same progressive advance is exhibited in each of the three separate batches of about one thousand each, of which the total before us is made up. Still the resultant difference is numerically small : it only amounts to somewhat less than three per cent. of the totals. Can any reliance be placed upon such a small difference?

The answer is that the difference *is* significant, past all bounds of reasonable coincidence or accident. The way in which the statistician treats the question is well recognised. He first inquires what is the amount of fluctuation or variation amongst the detailed measurements ; this gives him a measure of the degree of uncertainty attaching to the individual observation. He then asks what is the total number thrown together into one class in order to furnish an average. A great deal turns upon the magnitude of the numbers with which we are thus dealing. If, for instance, we had based our conclusion upon the averages drawn from classes consisting of only *ten* each, nothing worth a moment's notice would have been obtained. If based upon a hundred, the conclusion would still have been worth but very little. But in the case before us we have, roughly speaking, about a thousand separate instances in each of the three classes under comparison. It admits of proof that a difference amounting to three per cent. has chances measured by thousands to one against its having been of accidental origin. We need feel no manner of doubt that if we were to take a fresh batch of three thousand measurements of the same kind, and subject them to the

same sort of examination we should have a recurrence of the same results. This is, in fact, what we mean by a non-accidental phenomenon.*

The set of statistics from which the above conclusion was drawn were also employed to decide another, and very different question. It has, unless I am mistaken, been held that the growth of the head ceases at about 19. Our statistics, when the *A*, *B*, *C* classes are all thrown into one, and these are arranged in order of age instead of any kind of intellectual order, furnish a fairly satisfactory answer to this inquiry. What, of course, in full strictness we ought to do, is to get hold of the same men and measure them each year from 18 to 24, say, and then, by comparison of a number of such sets of observations, decide if there is any growth in the dimensions. This we could not do, for the men who appeared were all volunteers who could not be summoned for re-measurement, and indeed very few of them could have been found who would be resident for a sufficiently long period. But one of the many conveniences of the statistical handling of large numbers is that, for certain purposes, the examination of different men at the same time will be practically equivalent to the examination of the same men at different times. So here. Take 400 or 500 different men at each successive age from 18 to 24, and the results for statistical purposes will be just the same as if we took the same batch of men and measured them year after year. We feel confident in doing this, because we know that the

* The figures given in the table were obtained as follows: Three measurements of the head of each man were taken: the width, from side to side; the depth, from front to back; and the height, above a plane passing through the ears and eye-balls. These three multiplied together, yield what we may call a "head-volume," viz., a number proportional, on an average, to the size of the head. What in strictness we ought to have taken for subsequent examination would then be the *mean of these products*. But, as this would have taken very great labor, I have taken instead the *product of the means* of each of the three separate measurements. The difference thus involved is very small, and for the purposes of our inquiry is quite unimportant. The average of these products is about 240; the "probable error" of the individual products is about 17. The usual formula for the "probable error" between the means of two batches, each containing 1000, would be $17 \times \sqrt{\frac{1}{1+500}}$, viz. less than 1. The actual difference amounts to 7, which is enormously improbable as a chance result.

men who come up year after year all belong to the same homogeneous class.

AGE	18	19	20	21	22	23	24	25
HEAD . . .	236.4	236.7	237.6	238.3	239.8	240.6	243.5	243.5

These represent a total of 3192 men. The last compartment comprises those of all ages from 25 upwards, though those who are beyond this last age are extremely few in number. The figures indicate a slow but unmistakable growth in the size of the head during the whole of the college career. It may be remarked that there is no growth of stature perceptible during this period.

There is one very important conclusion which may be drawn from the results of these anthropometrical observations. It concerns what—if this is not too pedantical an expression to use—may be called the theory of examination. In England, and elsewhere, a large number of posts in the Civil Service and other branches of the state employment are awarded by the results of examination. There is, of course, in most or all of these some preliminary physical test demanded; but this is merely a requirement which every candidate must pass; it forms no part of the real examination itself. No marks are awarded for distinction in this respect, and no further attention is paid to it in case the candidate succeeds in satisfying the medical man that the minimum requirement has been attained.

It has been suggested, however, that something far beyond this might conveniently be introduced. As the grounds on which such a suggestion is based are not generally understood, a few words of explanation may be advisable. In most of the examinations of any magnitude with which the state is concerned, it may be taken as a fact of experience that the number of candidates bears some moderate ratio to the number of those who compete. If, for instance, there are 30 posts to be given away, we should expect perhaps 60 or 100 to apply for them: it would be a rare thing to find these numbers as low on the one hand as, say, 35, or as high on the other as 300 or 400. From this an important consequence follows. It is well known that whenever a considerable number of objects are arranged in order of magnitude or intensity in respect of any quality, the differences between them are very much greater towards the two

ends than towards the middle. This is only a case of the so-called Law of Large Numbers. If it was a case of measurement of stature, for instance, of one thousand men, we shall probably find that at the top and bottom of our list,—amongst the giants and the dwarfs,—two successive men might differ by as much as several entire inches ; whilst towards the middle we might range over one hundred without finding a total difference of a single inch. The same fact is notoriously true in examinations, wherever marks can be assigned with any accuracy. In mathematics, for example, the first few men will differ widely from each other in merit ; and, if the same does not hold good of the men who come last, this is partly because the really bottom men know better than to go in for such an examination. They have been otherwise provided for.

It follows from these two facts,—the law of grouping about the mean, and the empirical observation as to the proportional numbers of candidates,—that the men who are only just excluded are practically quite as worthy as those who are only just admitted. Accident rather than merit has determined their fate, the differences amongst them being too small for accurate determination. Suppose, to put a fictitious case, that three hundred men had applied for one hundred posts in the army or in the civil service. The examiners do their work, and give us a list of the one hundred who come out first. But if they have any experience they are well aware that if they were to go through the same process a second time, or the task were assigned to another set of equally competent examiners, the result would be different. All the men who were high up in the list would invariably be again secured, but it is not at all unlikely that some ten or fifteen of those at the bottom would find that their places had been taken by others.

We know, then, that in respect of the subject-matter of that examination it really matters very little which particular set of men we select, provided that we are speaking of those who are some considerable way down the list. We adhere to the examiners' order, not because we have any firm faith in its accuracy, but because there would otherwise be suspicion of unfairness. But it becomes a pertinent inquiry whether some other test, of a physical kind, might

not be introduced in order to distinguish between them. In the above example; if we take the ten who just get in and the twenty who just fail, we know that they are all, so far as the intellectual character under examination is concerned, practically on a par. But, so far as their physical character is concerned they are by no means on a par, but will differ as widely as any random selection of thirty might be expected to do. We might therefore gain much as regards the body, and lose very little as regards the mind, by subjecting these thirty to a purely physical test, and selecting the ten best, on this ground alone. So long as it was doubtful whether bodily and mental excellence were not to some extent antagonistic, there might have been considerable risk in adopting such a course. But now that we know that there is decided evidence in support of the view that these qualities are independent of each other, it is otherwise. Amongst the thirty men between whom no ordinary examiner could rationally and confidently discriminate, the physical examiner will probably find a very wide difference.

If it ever were found desirable thus to introduce physical tests into our examination procedure, the physiologist and medical man would have to be consulted as to the particular form of test to be selected. So far as our special results are concerned, I should have been inclined to think that the best single test is that of the breathing power. The general law that excellence in one department is correlated with decided superiority in all others seems to be more than usually applicable here. Experience shows that our physical first class, when selected on this ground, yields a slightly higher level all round than when selected on any other ground, though the difference is not great. I was also inclined to think, at first, that there might be a further advantage in the fact that this characteristic was, so to say, somewhat more deeply seated in our frame; that it might not, therefore, be so readily "crammed" for the special purpose of examination. But an expert in such matters informs me that this is not so, and that an ingenious "coach" can, with a little training, soon produce a large relative increase in the measured capacity of inspiration and expiration. The fact is, unfortunately, that whenever we resort to examination of any kind we shall sooner

or later find that we have to reckon with the crammer. His ways are past finding out, at any rate by devices to which the examiner can fairly resort. Many a little scheme, which in itself would have been excellent as a test, has been ruined in this way. Could the men have been brought forward in uniform ignorance of what they were going to be subjected to, we might have secured an excellent means of discrimination amongst them. But the crammer's foresight has anticipated us; and we soon find that what we are really testing is, not the natural capacity of the men, nor even their acquired capacity, but rather the ingenuity of their temporary teacher and the length of time they have been under his charge.

Whilst on this subject, there is one illustration of too important a nature to be omitted. It has been already pointed out that, so long as we deal with any large homogeneous class, we may safely assume the independence of the physical and mental qualities. We feel sure that by raising our demands in the latter respect we shall not be obliged to lower them in the former. But when the class is not homogeneous this postulate is no longer sound, and we may fall into very serious error. Broadly speaking, the Cambridge students, as already remarked, are a very homogeneous body. But there is found amongst them, at the present day, a sub-class of a very different origin. The Indian students, though not a numerous body, have furnished a sufficient number of data for us to be able to draw some conclusions as to their general average characteristics. These men, it need hardly be said, do not come from the fighting races of the Northwest of the British Indian Empire, but almost exclusively consist of highly educated Bengalees. Intellectually they show no deficiency. They are, in fact, the sort of men who rise to the top in any examinations in which they are pitted against other natives. Some of them have already, by their success in the Indian Civil Service Examination, earned posts in which they assist in governing the British Empire. So long as their numbers are relatively small, probably nothing but good comes of this; but we may fairly ask what would come to pass if, in course of time, whether owing to their real capacity, their disposition to the career,

or their relative population, the number of selected candidates of these nationalities were to become preponderant.

Those who regard consistent adherence to the course in which we have once started as a prime duty, will doubtless say that this is all as it should be; for that the men who rise to the top of the list have thereby proved their fitness for the work to which that examination was the portal. I am not going to argue this question, but will just offer one small contribution to its solution. These clever Asiatics, who, as we find, can often hold their own against their European competitors in the examination-room, how do they compare with them physically? Reverting to our scheme of arranging the men into ten successive physical classes, what we find is briefly this: The Indian students, on an average, stand in respect of their "pull" in the eighth class; in their "squeeze" and height, in the ninth; in their breathing power, in the tenth. They are nearly half a stone less in weight, and their eye-sight is similarly below the average. Those who admit that physical vigor has something to do with the foundation and retention of empires will allow that such facts as these may some day stand in need of careful revision and discussion.

J. VENN.

DR. WEISMANN ON HEREDITY AND PROGRESS.

I PROPOSE to consider Professor Weismann's views on heredity and progress as set forth in his recently published volume on the "Germ-Plasm" and elsewhere. But I must consider them here rather in their broad and philosophical aspect than in minute biological detail. Those who are endeavoring to frame a monistic interpretation of nature cannot afford to pass by the matured conclusions of a thinker distinguished alike by his mastery of facts and his power of bold, keen, and fearless speculation. But what they want is the net result of his observation and thought, that they may appreciate its bearing on philosophy in general and monism in particular. And if I find cause to criticise some of Dr. Weismann's conclusions I shall here base my criticism not on specifically biological or histological grounds, but on general or *a priori* considerations; for though it is folly to reject a carefully observed fact on *a priori* grounds, it is in accordance with sound method to submit a theory or hypothesis to *a priori* criticism, which is indeed the testing of the congruity of the hypothesis in question to the whole body of philosophical knowledge which constitutes the interpretation of nature which the critic has been led to accept.

Taking the question of heredity first, let us select three well-known facts of organic life and see how Dr. Weismann explains them—always remembering that he puts forward his explanation no-wise dogmatically but with due modesty and reserve. (The three facts I speak of are, first, the development of the higher animal or plant from a fertilised egg-cell; secondly, the development of certain animals or plants from buds; and thirdly, the regeneration of

lost parts.) This regeneration, to take that first, is seen both in the unicellular and in the multicellular organisms. If the oral or mouth-end of one of the infusorians be excised, this portion will be reproduced and the perfect infusorian reconstituted. It would seem to be essential that the part in which the missing parts are thus regenerated should contain a fragment at least of the nucleus of the cell which constitutes the protozoan animalcule. So that we may say that in this case a mutilated fragment of an infusorian cell possesses the potentiality of reconstituting by assimilation and growth the perfect unicellular organism. If a fresh-water hydra be cut in two and the two parts carefully watched, that which contains the base of attachment will be seen to regenerate a new mouth and tentacles, while that which contains the mouth and tentacles acquires a new base of attachment. Or, if the hinder "horn" of a snail—that at the end of which is the eye—be snipped off, a new horn, with a new eye perfect in all its parts, will be regenerated in a few weeks, the exact time varying with the temperature and the age of the snail. And this will occur not once only, but many times in succession. The group of cells which remain to a mutilated hydra or snail possess the potentiality of reproducing by assimilation and growth the perfect multicellular organism.

The same animal, the fresh-water hydra, will afford us a sufficient example of reproduction by budding. Under favorable conditions of temperature, with abundant nutrition, a little protuberance makes its appearance in the tubular body of the polype. This grows rapidly, and gradually assumes the form of a smaller hydra attached to the parental organism. After a while it becomes detached as an independent individual. The body-wall of the hydra consists in the main of two layers, an outer layer composed of large conical cells with small interstitial cells between the points of the cones, and an inner layer of nutritive cells, the two layers being separated by a thin supporting lamella. And it would seem that the bud takes its origin from the interstitial cells of the outer layer. Dr. Weismann indeed assumes that it takes its origin from a single cell of the interstitial series; and it is somewhat characteristic of his method that the assumption once made rapidly takes the form of a statement of

fact. "Each bud," we read, "must originally arise from one cell only, although the fact has not yet been actually proved"; and then, half a dozen lines further down, we have: "In the *Hydromedusæ*, then, each bud originates in a single cell." The admittedly unproved assumption already poses as a fact. The assumption itself, however, is not an improbable one; and if we grant its validity we may say that in the hydra a single interstitial cell has the potentiality of producing under appropriate conditions an organism similar to the parent.

Passing to the sexual method of reproduction we find the essence of the process to lie in this, that a single egg-cell produced by an organism unites and coalesces with a single sperm cell produced generally but not invariably by another organism of the same species, and that the fertilised ovum thus produced has the potentiality of producing under appropriate conditions an organism resembling the parents. In certain rare cases, where parthenogenesis obtains, fertilisation does not occur, but the ovum alone possesses the potentiality of reproducing an organism like the parent.

Now the problem is, in all these cases, to give something like a scientific explanation of what I have termed potentiality—the potentiality in the divided protozoan cell of reconstituting the perfect unicellular organism; the potentiality in the mutilated snail of regenerating a lost tentacle; the potentiality in certain interstitial cells of the hydra of giving rise, by cell-multiplication and differentiation, to young hydras; the potentiality in the fertilised egg of reproducing an organism like the parent. What is this potentiality? What is there actually present in the cell or cells concerned which may afford an embryonic basis for the changes which under appropriate conditions, follow in orderly sequence?

In presenting the answer which Professor Weismann gives, let us take first the case of the unicellular organism. This consists of a central nucleus, and of a cell-body. The latter exhibits observable differentiations of structure; but it is by the former, the nucleus, that these differentiations are controlled. The nucleus, therefore, contains, according to Professor Weismann, a store of specialised particles which are the bearers of the peculiar morphological qual-

ities of the cell-body.) These particles he terms *biophors*. The biophors are to molecules what molecules are to atoms. Just as the molecule is due to the combination and grouping of atoms to form a higher *physical* unit, so is the biophor due to the combination and grouping of molecules to form a higher *biological* unit. They are the smallest units which exhibit the primary vital forces, assimilation and metabolism, growth, and multiplication by fission. With such biophors, then, the nucleus of the protozoa is stored. "In the unicellular forms heredity will therefore depend, firstly, on the fact that all the different kinds of biophors which are required for the construction of the body are present in the nucleus in a latent condition and in definite proportions—very probably they have also a definite style of architecture; and secondly, on the periodical or occasional migration of these biophors into the cell-body, where they multiply and become arranged in obedience to the forces acting within them. The difficulty of ascertaining the actual mode of arrangement is nowhere greater than in the case of the higher unicellular forms. (How it is possible that the nucleus should allow only those kinds of biophors to migrate which are required to replace those structures lost by division?) And why do these biophors always move either in the direction of the missing oral region, or towards the posterior end of the body, according to which parts are wanting in the two daughter-animals? For the present these questions are unanswerable; and in the meantime we must be content with having shown how the materials for the construction of the cell-substance are transmitted from mother to daughter, and in what way they are placed at the disposal of the forces acting in the cell-body."

We may say, then, that in the reconstruction of a divided protozoön the potentiality is due to the assumed presence in the nucleus of hypothetical biophors. Of the nature of the forces which act upon the biophors and render reconstruction possible we know little or nothing. It is clear that we have not got much beyond our potentiality. (Nevertheless, the conception of biophors is likely to be helpful.)

In the multicellular organisms we have an assemblage of independently and hereditarily variable parts; but the number of these

independently variable parts, though great, falls very far short of the vast number of individual cells of which the organism is composed, for, in the first place, there are the multitudes of practically identical cells, such, for example, as the blood-corpuscles, and, in the second place, many of these parts consist of groups of cells, such, for example, as the spots on some butterflies' wings. Dr. Weismann assumes that for each independently variable type of cells, or groups of cells, there exists in the fertilised ovum a *determinant*, that is, a vital unit of a higher order than the biophor, consisting of a group of biophors, and possessed of special qualities. As cell-division proceeds, these determinants are distributed, and when they reach their final destination in the course of development, they break up or disintegrate into their constituent biophors and thus determine the structure of the ultimate cells. These determinants are capable of multiplication by fission; and hence a relatively limited number of these units suffice for the determination of the relatively limitless number of cells in the completed organism.

Here again, without undervaluing the suggestiveness of the hypothesis, we have to notice that what is really the essential problem—the distribution of the determinants during cell-division—remains untouched. In place of the vague potentiality of the fertilised ovum we have certain hypothetical structural units, the determinants. How the potentiality is distributed, and how the determinants are distributed, are alike unknown. It is clear that we have not got much beyond our potentiality. Nevertheless, the conception of determinants, as an attempt to think along physical lines, is to be welcomed.

With regard to the budding of such an organism as the *Hydra*, Professor Weismann has not much to offer that is helpful towards the solution of the problem. What he does offer practically comes to this: Since an interstitial cell has the potentiality of giving rise to a new *Hydra*, such cell must have, in an inactive form, all the necessary determinants. *Voilà tout!* So, too, with regard to the regeneration of lost parts. [The cells which remain are assumed to possess supplementary determinants for the reconstruction of the

parts which are lost.) There is but little advance here on the old-fashioned potentiality.

It must be remembered that we are regarding the matter from a standpoint which only permits a very broad and general view. There is in Dr. Weismann's work a great deal of accurate and suggestive biological detail, which gives to his whole treatment of a difficult subject a value which is well worthy of the generous welcome which it has received. And if in endeavoring to pierce to the hidden cause of hereditary transmission he has failed to do more than suggest that the transmitted potentiality is due to transmitted biophors and determinants, this does but show how far even our leading biologists still are from being able to give a detailed explanation of the mysteries of organic development. As was to be expected from a student of morphology, the suggested explanation is mainly structural, though references to the unknown forces at work are not omitted. And this, no doubt, in the present state of scientific knowledge, is the wiser course. There can be little doubt that structure is merely the visible expression of the subtle play of invisible forces; but we are wise to focus our attention first on the structure and then endeavor to pierce to its hidden cause. Still there is perhaps too great a tendency on Dr. Weismann's part to lay too much stress on the transmission of material particles, too little stress on the transference of subtle modes of energy. He assumes that each vital unit, from the lowest to the highest, can only arise by division from another like itself, and is, therefore, forced to attribute the regeneration of lost parts in the unicellular organism to migration of biophors from the nucleus, saying that such regeneration cannot be the result of the emitted influence of the nuclear substance. This is so, on the assumption adopted; and it may be so in nature. But it is possible that the reconstitution is due to the play of molecular forces and is analogous on the biological plane, to the reconstitution of a chipped crystal on the physical plane.

I must now pass to the second division of my subject, namely, a consideration of Professor Weismann's latest views on progress; and here it will be well to confine our attention to those higher animals which multiply by the sexual process, each individual taking

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origin in a fertilised ovum. The ovum and the sperm by which it is fertilised alike contain germ-plasm ; and this germ-plasm is stored with determinants of common derivation by multiplication with those, the distribution and disintegration of which gave rise in development to the parental organisms. We may put the matter diagrammatically thus : The compound nucleus of the fertilised ovum is divided into two parts of similar potentiality. Of these, one, through the distribution and disintegration of the contained determinants, gives rise to the developing organism. The other, increased in volume through nutrition and growth and subdivided into ova and sperms, is retained by that organism in the undistributed condition, to subserve the purposes of further reproduction. Now progress depends on variation ; and the question here is :—how do effective variations arise? By effective variations I mean those in virtue of which the offspring is raised, in any particular respect, beyond the maximum in either parent or in any ancestor. We may distinguish two kinds or phases of progress. First, progress through the selection of existing maxima ; secondly, progress beyond the existing maxima. The latter involves variations of the kind which I have here termed effective. It is obvious that in the evolution of the existing forms of life such variations must again and again have occurred. How do they originate? To what are they due?

Let us first note that no process of selection of maxima or elimination of minima can of itself give rise to effective variation. All it can do is to lead to breeding from maxima only. But, of course, if the maxima are raised through effective variation, *then* selection or elimination may conduce to interbreeding between these new maxima and thus lead to effective progress. Secondly, let us notice that no getting rid of determinants, through differential division, either in the process of the multiplication of the cells which contain the germ-plasm, or in the process known as the "extrusion of the polar cell," or in any analogous process in the division of sperms, can of itself contribute to effective variation. Such effective variation must depend, according to Professor Weismann's principles, on the production of new and more highly evolved determinants. Again we must note that no mingling of determinants from

different sources can lead to effective variation, or the genesis of more highly evolved determinants. At one time Dr. Weismann was inclined to attribute effective progress to that mingling of the nuclear matter of ovum and sperm in sexual reproduction to which he has applied the term *amphimixis*. Some three years ago the present writer drew attention to the fact that what he now terms effective progress could not be so accounted for. Other writers have insisted on the same fact. And now Dr. Weismann himself says that "the origin of a variation is equally independent of selection and of amphimixis."

To what then does Dr. Weismann attribute effective variation? "It is due," he says, "to the constant recurrence of slight inequalities of nutrition (the term 'nutrition' being used in its widest sense, so as to include differences in temperature, etc.) in the germ-plasm which effect every determinant in one way or another, and differ even in the same germ-plasm,—not only in different individuals but also in different regions." "We cannot possibly attribute," he further says, "the immense number of adaptations to rare, fortuitous variations, occurring only once. The necessary variations from which transformations arise by means of selection, must in all cases be exhibited over and over again by many individuals." They seem to be due to "the permanent action of uniform changes in nutrition." "We are therefore undoubtedly justified in attributing the cause of variation (in varieties of plants which have originated from seeds) to the influence of changed external surroundings."

How changes of nutrition produce particular variations in the determinants of the germ-plasm Dr. Weismann has not pretended to say.

Dr. Weismann remains as firmly convinced as ever that characters acquired by the individual are not, and on his interpretation cannot be, transmitted to that individual's offspring. All variations arise endogenously within the germ-plasm; there is no transference to the germ-plasm of exogenous somatic variations impressed upon or evoked in the muscular, nervous, epithelial, or other tissues of the body. In this he is quite logical and consistent. And he is in my opinion right in maintaining that there is at present no conclu-

sive evidence in favor of such transmission of acquired characters. Facts or groups of facts with a general tendency in that direction there may be ; but definite proof, in my judgment, at present there is not. If such proof should eventually be forthcoming, it will be difficult to resist the conclusion that the determinants of the germ-plasm, if such exist, are subject to the influence of the complex transformations of energy which take place in the somatic tissues. It is more readily conceivable that the determinants are modifiable by the functional activity of parts which originate by the distribution and disintegration of similar determinants, than that they are modifiable by material particles, biophors or other, transmitted to the germ-plasm from the varying somatic parts. All such speculations are, however, at present, premature.

We may now sum up in a few words the salient features of Dr. Weismann's views on development, heredity, and progress, in so far as they apply to the higher animals. (1) The development of the individual from a fertilised ovum is essentially germinal ; that is to say the compound nucleus already contains in the form of determinants the germs of all the varied parts of the complex organism into which it will develop. (2) Heredity is provided for by the constant holding in reserve of some of the germinal matter which increases by growth and cell division, portions thereof being periodically detached in the form of ova and sperms. (3) Effective variation, on which progress through natural selection depends, is provided for by the influence of "nutrition" upon the determinants contained in this reserve germ-plasm.

The first of these propositions is a modern restatement of the old hypothesis of "evolution"—this word being here used in a sense different from that which is to-day in every one's mouth. "Evolution" here means unfolding ; and is applied to the view that the potentiality of development of the fertilised ovum is due to the existence therein of miniature parts exactly resembling those of the adult. It is opposed to "epigenesis" concerning which Professor Weismann says : "I tried in several ways to arrive at a satisfactory epigenetic theory, which, starting from a germ-substance of comparatively simple structure, should exhibit the various differentiations of

the organism as due to regular changes brought about by the division of this primary structure. But the more I considered the problem as time went on, the more I was convinced that such a solution was impossible." This I take it is a distinct and total rejection of epigenesis. And in the light of this complete rejection of epigenesis we may infer what a determinant is. It is, in the first place, a particle of germ-plasm which corresponds to and determines the cells or groups of cells which are independently variable. Let us suppose that my finger-nail is an independently variable part, the product of a single determinant. Then if the nail was formed by "evolution" and nowise epigenetically, its determinant contained in miniature all the minute details of its structure, only *enfolded* and not yet *unfolded*. So that, in the second place, the determinant though it is not a miniature of the fully formed part, contains enfolded miniature germs of all the details of that part. Every detail is already present, but the details are not yet marshalled and ordered. And in general all the details of the adult (with the exception of those which are due to repetition and could thus arise by multiplication) are represented in the nucleus of the fertilised ovum.

It is questionable whether this structural thesis can be maintained either biologically or physically. But it is when we come to consider the energy rather than the matter, that the conception of "evolution" (unfolding) seems to me completely to break down. It is inconceivable that in the compound nucleus of the fertilised ovum there exist in miniature all the varied modes of energy that characterise the life of the adult organism. We are forced to believe that this complex energy arises epigenetically from the simpler energy of the ovum. And if there is this epigenetic development of energy, it is reasonable to infer that there is an epigenetic development of the structure which manifests this energy. I believe therefore that the first of the three propositions is unsound at the core and should be rejected.

The second proposition, if it be held to involve an absolute distinction between germ-plasm and body-plasm, is of doubtful validity. But if it be taken broadly as a statement of the view that cer-

tain cells remain comparatively undifferentiated and retain the potentiality of reproduction, it may be accepted.

The third proposition, that effective variation is due to the influence of nutrition upon the determinants contained in the reserve germ-plasm, seems to throw too much stress on the nutrition and environment, too little on the inherent activities of living matter. But if it be regarded as an expression of the fact that all effective variation is a joint product of the inherent activities of germinal cells and the conditioning effects of their environment, it is a self-evident proposition which may be cheerfully accepted.

C. LLOYD MORGAN.

AGNOSTICISM.

A POSTHUMOUS ESSAY.*

AS the Greek word *Gnostikos* means *capable of knowledge*, we may conclude that an *Agnostikos* is, according to the name he himself assumes, a man *incapable of knowledge*. And, because he is incapable of knowledge, he concludes that no knowledge is obtainable. This may be admirable logic, but it is a sorry foundation for a philosophy of enormous pretensions.

It is only because the higher—or, perhaps, it would be more correct to say, the deeper—philosophy is so little studied in England that so shallow a thing as Agnosticism has been so extensively accepted among us. The chief champion of Agnosticism has been

* The life of William Macall was uneventful. He was born at Largs (Scotland), and was educated for the ministry. For many years he was prominent in the Unitarian pulpit, and, finding this too narrow, accepted the Rationalist press and platform as opportunities for propaganda. His literary friendships were notable—Professor Wilson, J. S. Mill, and Carlyle among the illustrious list. He commenced his autobiography in the pages of *The Agnostic Journal*, but only reached his college days; he died, disappointed to the last, but with rugged independence unimpaired. His principal works were: *The Elements of Individualism*; *National Missions*; *Foreign Biographies* (two volumes); *Bygone Days* (three volumes from the German); *The Man of Birth and the Woman of the People* (three volumes from the Swedish); *Agents of Civilisation*, etc. In a brilliant volume on *The Newest Materialism* he assailed Spencer memorably. *Moods and Memories* was published shortly before his death, four or five years ago, and preserved some of his best poetry. He consistently refused a Civil Service pension. Mr. Gladstone was influenced to offer—no man despised money more than he, even in gaunt adversity. The essay here published for the first time was written shortly before his death and presented to Mr. Charles A. Watts, to whom we are indebted for the manuscript. The reader will find further information on William Macall in an attractive article by Amos Waters, which has appeared in No. 313 of *The Open Court*.

proclaimed by his enthusiastic admirers the greatest of all philosophers in language—ludicrous from its exaggeration, and pitiable from its imbecility. Verily, the god and the adorers of the god are worthy of each other. This profound thinker made the astounding discovery that the universe is unknowable, is inscrutable. With the recognition of the sublime discovery the whole range of mental speculation is to be revolutionised; all the sciences are to receive new life and grand transformation; politically, socially, morally, religiously, the whole world is to undergo the divinest metamorphosis. But suppose that there has really been no discovery; suppose that from the remotest times men have viewed the seen as the image of the unseen, earth as the vestibule of the skies; suppose that every religion has mystery as foundation and as essence; suppose that every religion claiming to be revealed declares that the revelation simply deepens the mystery—must not Agnosticism, in reference to its leading principle, be spurned as an egregious quackery?

Agnosticism confounds things that have no relation to each other. While vindicating science, it makes a show of patronising religion and of reconciling religion with science. With the Unknown and the Unknowable science has nothing whatever to do. The Unknown and the Unknowable are, for science, the non-existent. As its name implies, science deals with the Known and the Knowable. When it prates of the Unknown and the Unknowable, it uses a meaningless jargon. On the other hand, it is in the Unknown and the Unknowable that religion lives, moves, and has its being. Religion is impelled towards mysticism, just as science is impelled towards rationalism. It is a blunder as monstrous to introduce mysticism into science as to introduce rationalism into religion. A mystical science is a contradiction in terms. A rational religion is a contradiction in terms. Hence Protestant churches, to the extent that they are rationalistic, are not religious. It is in phantasy and emotion that religion has its life, and it is in symbol and rite that it has its expression. In Protestantism phantasy and emotion have slender sway, and symbol and rite are subordinated to dogma. The religious penury of Protestantism is as flagrant as its foe, Ro-

manism, represents it. Dogma had no place in the ancient religions, has none in the deepest Oriental religions ; and if that phantom called the Religion of the Future ever takes solid shape, it is by the rejection of dogma that it must begin, and by the adoration of mysticism as the sole source of spiritual sympathy and vitality. The persons called Liberals prophesy the reign of reason, in which God is to be tolerated if content with the fragments that fall from the altar of the goddess Reason. But why should we expect them to be more reasonable than the universe itself, in which nothing is discernible but the action of instinctive force? It is to this instinctive force, the supreme creative energy, that the mystical element in the individual must draw near. In opposition to Rome, Protestantism vindicated the right of private judgment, as if religion were wholly the affair of the cold and barren understanding. Private judgment very soon finds that it can dispense with religion altogether. But, if the individual is convinced that the whole past has significance, and the whole seen and unseen universe has suggestiveness entirely in reference to the instinctive and the mysterious in himself, he plunges further and further into the ecstatic abyss of Intuition. The Panontist, the believer in Instinct as the greater and in Reason as the lesser, is the harbinger of an enfranchisement which may be yet far off, but which is sure at last to arrive.

It is as a genteeler, and at the same time more cowardly, kind of Atheism that Agnosticism is attractive to many silly and superficial mortals. A frank, fanatical Atheist justly demands from us the esteem due to earnestness. But the man who, purely as a dilettante, debates the question of God's existence, must receive from us the dilettante's reward.

Often it is said that the present age is a sceptical age. But no age is sceptical, though one age may be more influenced than another by the sceptical spirit. Men in the mass are always believers, and are the more superstitious the more there is of apparent incredulity. *Skepsis* means deliberation and the discussion which is the result of deliberation. Intellectually it is an instrument, morally it is a mood ; but it can never be a system. It does not of necessity imply doubt, and it is never identical with negation. A true scep-

tic is a true thinker ; and it is ridiculous to dignify rabid negationism with the name of scepticism.

In human communities all real growth is moral growth ; all real decay is moral decay. And there is peril to every community in which intellectual progress is not simply the minister of moral development, the food of the moral life. Now, a chief characteristic of our own age is superficial intellectual excitement, which allies itself with other causes in producing moral languor and debility. The salvation, the greatness of nations must be sought in the combined action of holiness and heroism ; and if heroism perishes, holiness must perish too. What depth of meaning there is in the grand Greek saying, that war is the father of all things ! How the point and pith of that saying mock the idolatry of comfort, which is the only religion of the present generation ! Religion of a higher, a diviner kind has wholly lost its empire, and has dwindled into a drawing-room entertainment, diversified by a subscription to a local charity. The Church of England has immense social power, but not one feeblest throb of spiritual vitality ; and the dissenting sects waste their small remaining stock of strength on crotchetts and cants. Romanism alone has the feeling and the idea of what religion should be, though, instead of marching valiantly and working fruitfully as in the Middle Ages it marched and worked, it cravenly seeks refuge in obscurantism as a stronghold. The significance of conflict in the economy of the universe men must again see if again they are themselves to be holy and heroic.

A man of eminent genius discoursed eloquently on hero worship, and spent much of his time in denouncing shams. But no one was ever made more heroic by his eloquence, more honest by his denunciations. The splendid pictorial phrases of the illustrious writer were fervently admired and speedily forgotten. In truth, if we adore heroes, the less disposition have we to be ourselves heroic, for we are led to contrast their bravery and achievements with our own feebleness. In echoing also him who anathematises shams, what shams we ourselves inevitably become ! No, heroism must be inspiration, discipline, action ; and, to vanquish semblances, we must ourselves be realities.

But when we behold all around us moral lassitude, moral *as-thenia*, moral *Abspannung*, how are we to heal our own moral atony? How are we to grow resolute and bold in the midst of such tragical moral declension? Even our very despairs, however, may be miraculous springs of vigor and courage, for they may lead us to count our own life as nothing, and enable us, in sublime self-annihilation, to do marvellous deeds. But the force of will must be equal to the loftiness of the ideal, and the fire of the enthusiasm, otherwise meagre enough, must be the result. And meagre enough it may be after even our most strenuous efforts, for the time of the world's redemption may not yet be come.

We are not, however, sent by the supernal powers to be heroes, saints, martyrs, prophets, but men. Only when we are hindered, only because we are obstructed, in our free, spontaneous career are we compelled to be, and are we justified in being, redeemers of our race. Novalis, a profound thinker, but often more subtle than profound, has said that we are on a mission—are called to the culture of the earth. But it is as absurd to talk of natural duties as of natural rights, about which Socialists make such a fuss. Both natural duties and natural rights are figments. All that is required of man is to be man: in order to be man, he must be indomitably valiant; and thus the English *manliness* corresponds to the Latin *virtus* and the Greek *andreia*. From courage idealised flow all human goodness and all human greatness. Civilisation has worth, and brings blessing just so far as it idealises courage. This the Greeks at their noblest time and the Romans in their best days clearly saw. And the doctrine had a sublime vindication both in the principles and the practices of the Stoics. Idealised manliness is idealised order and idealised freedom. For the individual who is armed with true manliness seeks freedom only as the condition or preliminary of order.

When does the mystery of the Invisible begin to overwhelm his soul? From the first moment of his existence. The child brings into the world the plenitude of the inner infinite, to which all knowledge and all feeling can never be more than correspondences. It is only by slow degrees that the child can seize the finite: for a

long time external things are to the inner infinite nothing but vagueness. The fundamental fallacy misleading and vitiating all philosophical speculation is the belief that sense is the primary apocalypse to poor mortals. But sense merely seizes something analogous to, or symbolical of, what already exists in the heart—existed there, indeed, even when the child was in the mother's womb. Hence education ought exclusively to be the cultivation of the instinctive element, which, however, is always disregarded, because it is invariably confounded with brutal appetite.

But if the inner infinite, disclosing and unfolding itself through the instinctive element, is more than the chief part of the individual, is verily the individual himself, must not the animating principle of universal nature be recognised as wholly an instinctive energy? Without doubt. But what is lost by the admission? Yea, in sooth, is not much gained? When God is depicted as an Omniscient Being, as an Omnipotent Creator, as Supreme Reason, as a Loving Father, we are driven to ask why there are so many miseries and monstrosities, why the history of the world is nothing but a chronicle of cruelty and crime. It is the Ideologists, the scribblers of Theodicæas, who are the real Atheists, not the Panontists—not they who frankly and gladly avow that there is a God, but deny that there is any proof of omniscience, of omnipotence, of reason, of love, in the sense in which these words are by theologians accepted.

You say that to speak thus is blasphemy; but the charge of blasphemy is so often and so easily brought that small heed must be given to it. It is gross presumption in man to attempt the vindication of God's ways: it is wiser and better to ascertain what those ways are, and to walk in them so far as our strength permits. Compared with the inner infinite and the God there and the outward infinite and the God there, how worthless are human traditions! Yet what but human traditions are all theologies? They are, therefore, interesting no further than they harmonise with our spiritual aspirations and needs. What is good in them we appropriate and assimilate; what we deem bad in them we reject, without, however, blaming our neighbor for taking as spiritual nutriment that which we condemn.

In a country where, according to the French jest, there are a hundred religions and only one sauce, what a wearisome and profitless task it would be to assail that which is intellectually absurd in those hundred religions ! If in ignorance, stupidity, bigotry they impede our march to perfection, we thrust them aside without ceremony : that is all. Woe to him who is dominated by the proselytising temper ! His craze irritates the whole host of other crazes, and intensifies the contagion and the curse of religious lunacy. A fresh convert is an additional lunatic. When, in defiance of historical testimony, multitudes can be fascinated by the crass notion that the English are descended from the ten tribes of Israel, what hope can there be of the emancipation of the whole people from theological thralldom ?

Life creates life, and a divine life is the only infallible evangel : the heroic achievements of the divine life are the only fecund ideas. Suppose that the entire past were to be effaced from human memory, we should still stand in the presence of the universe; and be ready for new and noble action ; and from our deeds would spring thoughts which themselves would be deeds. It is from this grander Gnosticism, not from a rickety and ranting Agnosticism, that earth must seek moral impulse and moral sustenance. Doubtless are widely spread in the world, and especially in the English world, the grossest delusions. It is not these, however, which discourage the earnest reformer, but the indifference, the apathy, the coarse materialism, the tyranny of fashion and custom, the insatiable selfishness, the unscrupulous avarice, the social hollowness, the conscious—and, still worse, the unconscious—hypocrisy.

Every earnest reformer in a country whose political might and commercial expansion contrast with its moral degradation, and, what is sadder far, its moral debility, labors and combats as a soldier in a forlorn hope. He is at last driven to feel that his silence may be more potent than his speech, and that he can best be a reformer by ceasing to take the reformer's attitude, and by being as natural as the bird in its song and flight and as the flower in its bloom.

It is the easiest, and yet the hardest, of all things to be perfectly natural ; and this is the earnest reformer's perplexity. What

he has chiefly to aim at is not to learn, but to unlearn ; and, when unlearning, he may wander into the region of eccentricity. The earnest reformer may become eccentric in the effort to shun eccentricity, and paradoxical in the endeavor to eschew paradox. To be a man, a natural man, he must be once more a child. We might almost say, with a divine teacher who was a son of the people, that he must be born again. After being born again, after living for the second time a childlike life, he can live anew a manlike life, but with more effulgence and plentitude than of old.

There is a cant in these days about solving problems. With solving problems the earnest reformer, in his regenerate existence, has nothing to do. In the universe there are no problems to be solved. But from the great deep of the immensities there are affluences evermore, and it is by bathing in these that the earnest reformer wins new life for himself and his brethren.

We are compelled to regard the earnest reformer as the most victorious refutation of the Agnostics and their pretentious and preposterous gospel. It was said of Malebranche that, while he pretended to see, in accordance with his system, all things in God, curiously enough he did not see that he himself was mad. And, as becometh sciolists, the Agnostics mistake *skēpsis* with an *eta* for *skēpsis* with an *epsilon*. There are many besides the Agnostics who make the like blunder. As a timid, trimming, twaddling, negationism, as a deification of the privative alpha, can Agnosticism honestly demand from us any serious consideration?

Over and over again in the world's history the only argument against sophistry has been moral revolt, though often this moral revolt has been limited to the solitary voice of the prophet. Even for the most fervent prophet, however, the most earnest moral reformer, battling with Agnosticism, can seldom be more than a *skiamachia*, a fighting in the shade, a fighting with shadows.

Positivism, as its very name implies, has positive principles. The originality, as well as the verity, of these has been questioned by Saisset and others. But they offer points of assault : we have something to assail, and we know what we are assailing. With the privative alpha of Agnosticism, however, how can we grapple?

When the tiny cherubim, with wings and head, but no body, were asked to take a seat, they replied that they had no wherewith. Now, it is the lack of a wherewith which makes Agnosticism invulnerable. We cannot smite its head, for it has none ; we cannot seize its wings, for it has none ; we cannot kick a more solid part, for it has none. Our good friend, therefore, the prophet—the earnest reformer—has a tough job of it when striving to vanquish, by sheer moral eminence, beautiful moral effulgence, the dreary drivellers who glorify themselves with the name of Agnostics, though Agnoetists would be a more suitable designation.

Yet, though they knew it not, the instinctive element seems to have inspired them in the choice of a name for their supreme cretinism. The Greek verb *Agnoeo* means to be ignorant of, not to notice or to know. *Agnoema* means error. *Agnoia* means ignorance. *Agnosia* has the same meaning. *Agnomoneo* means to be ungrateful, to be or to act without sense or consideration. The second part of this definition is explicit enough ; by the first we learn that Agnosticism steals ideas, but does all it can to conceal the theft. *Agnomonos* means foolishly ; *Agnomosune*, ignorance, inhumanity, unskillfulness, imprudence, perverseness. He who is *Agnomon* is not merely without judgment, unjust, but possibly without the teeth, *Gnomones*, by which the age of animals is ascertained. But the Agnostic, though destitute of the teeth of wisdom, may deem the tongue of unwisdom a compensation. To the Greek *Agnostos* the Latin *Ignotus* corresponds. Both words mean *ignorant* as well as *unknown*.

But, gentlemen, if you know nothing, why should you worry and weary us by your idiotic cackling ? Newton and other great men have, in beautiful modesty, made light of the knowledge which they have gained by the toil and the thought of long years. You, the Agnostics, obstreperously declare that you know nothing, yet talk and act as if you knew everything. If you had the faintest perception of the comical, you could not fail to see that the man who says that nothing can be known, and yet parades his own omniscience, is only fit to figure in a comedy.

Agnosticism is saved from being the most contemptible of frauds

by being the most ridiculous of farces. And it is not the less both a farce and a fraud because some men of undoubted scientific ability have given it their countenance. They have been induced to do so chiefly from the desire of tripping up Orthodoxy, instead of smiting it frankly in the face. Besides, Orthodoxy, so far as it meddles with science, is itself a species of Agnosticism : the less it is acquainted with science and scientific evidence, the more authoritatively, oracularly it speaks on scientific subjects. This also has its comic aspect. When a famous, but eternally blundering, statesman, not satisfied with ruining his country, went back to the dawn of creation to show of what impudent feats, of what silly freaks, his sophistry, sciolism, arrogance combined could be guilty, the more there was the pretence of instruction and edification the more the laughter of the beholder abounded. But the famous statesman, lacking humor and blinded by self-idolatry, was at a loss to discover what the essence of the joke was. It is an axiom of Orthodoxy that the less a man knows the more competent he is to pronounce on points of evidence and faith. Thus a great scholar like Gesenius, who devotes his whole time to the Oriental languages, and especially Hebrew, is not worth listening to when he tells us when and in what circumstances the various books of the Old Testament were written : the only man deserving heed is the young Anglican curate who is ignorant of Hebrew, and whose chief training has been in the cricket-field !

Agnosticism could not have been accepted in science unless it had been already accepted in theology. Bruno Bauer, in his valiant book on "Christ and the Cæsars," has demonstrated that what are deemed conflicting currents are really portions of one mighty stream, and that Roman Stoicism and Apostolical Christianity had essentially the same aims. And, as if destined to be not enemies, but coöoperators, Jesus and Seneca were in the strictest sense contemporaries, Seneca having been born in the second year of the first Christian century. We find that in every age there is one primordial oceanic rush. The leading characteristic of the eighteenth century was Illuminism. At the close of the century the light grew lurid and broke into maddest lightnings. Except in regard to its Illuminism, never can the eighteenth century be properly studied. All

were Illuminists : the Freemasons, the members of secret societies, the founders of sects, the Encyclopædists, the charlatans so numerous, the scoffing Deists, the rabid Atheists. John Wesley was an Illuminist no less than Cagliostro, Voltaire no less than Swedenborg, who, absurdly enough, has by Emerson and others been called a mystic, whereas, as a visionary, he was the strenuous foe of mysticism. Illuminists were the cynical Frederick of Prussia and the filthy Catherine of Russia. Its Illuminism was, in the main, generously placed at the service of humanity ; and ever should humanity be grateful for the aspirations and achievements of the greatly decried and greatly misrepresented eighteenth century. Everything was thorough and vast in the eighteenth century, its crime and its black-guardism not excepted. Fearless was falsehood, and fearless was also the hostility to falsehood.

As if exhausted by the Napoleonic wars, the nineteenth century has had no life apart from science and its colossal and manifold and miraculous applications. But the impulse to scientific development has come from the pressure of mechanical necessity, whereas the Illuminism of the eighteenth century sprang from the instinctive element. It is the absence of this instinctive element that marks the nineteenth century, which might fitly be named the century of Externalism. But it is the language of Internalism which Externalism deems it befitting to employ ; hence boundless confusion in action and in speech, and hence the stamp of mediocrity on everything.

The true, the divine community is a congregation of instinctive individualities. But these exist not ; therefore, the true, the divine community is a thing of the future, or, perchance, simply an unrealisable dream. In these days the only art which has been perfected is the art of association. Not, however, by the elevation, but by the annihilation, of the individual has the perfection been gained—the sluggish, slavish surrender of the individual to a gregarious tendency. A Socialist sect is founded and a joint stock company is formed from the same motives and in the same manner. One of the most lucrative occupations is that of a conspirator, and, so far from involving any danger, it is the surest and swiftest road to influence

and fame. The conspirator enters as calmly on his work as if he were taking a share in a coöperative store. A nice, genteel profession is that of a conspirator ; and, even if his schemes fail, how must the vanity of a conspirator be gratified by seeing a prime minister crawling at his feet ! If the trade of a conspirator does not suit you, try your hand as the leader of a strike. As effectually as a conspiracy, a strike effaces, slays the individual, and exalts, deifies Externalism. From the time when Robert Owen first proclaimed his doctrines, coöperation has marched with gigantic steps, but always in the direction of anarchy. In pleading zealously for co-operation and possessing himself in a high degree the genius of organisation, Owen contended no less earnestly for the doctrine of circumstances—that is to say, for fatalism in its very worst form ; forasmuch as man, so far from being the creature, is the creator of circumstances. As coöperation has gained sway, just in the same measure has fatalism extended, and from fatalism hath come anarchy, and from anarchy hath come death. Anarchies neutralise anarchies, and the neutralisation is called government.

Religion should here be the main vitalising and harmonious force ; but it was with religion itself that the anarchy began. The anarchy, however, religion strove to conceal by multiplying coöoperative agencies. The more also the fables of theology were thrown to the lumber of the past, the readier theology was with new fictions and new phrases. When religion has degenerated into the tradition of a tradition, it is bewildered what to do to prolong its empire. As the forerunner of Agnosticism, the religion of the nineteenth century said that we must admit mysteries, but not regard them as intrinsically unreasonable. As, however, the mysteries of theology are traditional mysteries, they are not properly mysteries. Mystery is that only which presents itself spontaneously to the innermost soul of the individual. And every man's mysteries are incomunicable to every other man. If it is foolish to talk of traditional mysteries, it is fatuous to speak of natural law in the spiritual world. There is no law in nature ; and the slang about law in nature is on a level with certain doctrines and sayings of the mediæval schoolmen that have long been discarded. The crazes and phrases of the

mediæval schoolmen went far in the direction of bathos ; but they are preferable to the crazes and phrases of theological and scientific Agnosticism in our own day. When we listen, for example, to discourse about the survival of the fittest, we ask whether this means anything except that what has survived has survived. For, otherwise, it is exactly the unfittest things which survive ; the noblest, most beautiful things which perish.

At the close of a Panontistic homily, or Panontistic rhapsody, or whatsoever the reader may choose to call it, we leave the reader to draw his own deductions, make his own applications. What the reader might deem the protest, the proclamation of a solitary man, is really the confession of a life's experiences. It is questionable whether literature in these days, unless it takes the shape of confession, has any value. The confession of a man who from his earliest years, from his very earliest remembrances, has gone deeper and deeper into the inner infinite of his own breast, and who has nothing to offer but the treasures gathered in his interior journeys, may lead some lonely brother to make the life within the divine life for himself and a redeeming power for others. Recently Theosophy and Mysticism have found exponents ; but in the exposition it is always assumed that, if any progress is to be made in the mystical life, Jacob Boehme and many kindred writers must be diligently consulted, assiduously studied. It is our ambition to show a better way. Far less is it our desire to make war on Agnosticism than to lead earnest and devout souls to a realm remote from sects and systems—the realm of sweetest, most sacred feeling, and of richest phantasy ; the realm of ecstatic instinct, in which he whom we call God himself dwells.

WILLIAM MACCALL.

AUTOMATISM AND SPONTANEITY.

IN the mediæval world man's longing for close communion with the powers that underlie creation was readily satisfied. His terrestrial dwelling-place with its starlit vault he believed to be the universe; and himself, as immortal soul, the supreme concern of God and the Devil, of all the hosts of heaven and all the imps of hell.

What humiliating shock to this fondly nurtured self-importance, when—at last convinced by science—modern man found himself standing amid infinity on the thin crust of an inferior orb, whirling at a tremendous speed round and round one of the myriad suns that people unlimited space.

Worse still, he had to learn that all the wondrous happenings of nature, hitherto attributed to the volitional fiat of creating agents, and held to be taking place solely for his own sake, were in reality the rigorously necessitated outcome of mechanical laws that had been in operation since the beginning of things.

Under such mechanical dispensation, extending into abysmal space and over ages upon ages of time, what then was he, diminutive earthling, with his little span of life?

As corporeal being the constituent particles of his organism were thus fated to obey the same undeviating laws that govern the figurations and motions of inorganic bodies. And this necessarily implies, that all vital activities, so-called voluntary movements included, result—beyond his volitional control—from the strictly determined play of mechanical impact.

As a percipient being he was merely passively mirroring what

in reality was occurring outside of him on this planet or in the boundless universe. Mind and body, he was but a tuneful instrument constructed and played upon by external powers. .

And though Leibnitz, whose teachings gained the ascendancy in some quarters, conceived the percipient soul as an entelechy or self-acting entity, yet as such it was likewise only reproducing within itself in a representative way either innate ideas, or the orderly events of an independent outside world.

Despite a life of growing experience, filled with thrilling emotions, self-determined volitions, and vaunted deeds, we were shown in the light of science to be only so many conscious automata, only marvellously intricate appendages to nature's all-comprehending mechanism.

It is true, under the sway of the mechanical philosophy, and mainly in reaction against its materialistic tendencies, our sensations were proved to be the veritable elements out of which the world we perceive is actually formed. And it is now commonplace of philosophy, that what we call the sweetness of a thing is only the quality of sweetness belonging to our own sensation ; and what we call the thing itself only a compound of our own visual and tactile impressions.

Berkeley, as we all know, on the strength of such reasoning, and to the inexhaustible merriment of his contemporaries, denied altogether the existence of an outside material universe. For if the world we actually perceive is out and out composed of mental elements, what need of another second world materially subsisting beyond such perception? Consequently, according to this view, percepts are the only constituents of the world, and its so-called objects are mental phenomena and nothing else.

Yet, even then, these percepts of ours, constituting a world of purely ideal consistency, were not believed to be products of our own making, but only flashed upon our mind by a corresponding volitional fiat of the Deity. Man, consisting thus simply of a percipient mind, soul, or spirit, was here again only passively and representatively mirroring that which was being fashioned and actuated outside and independently of himself.

In the light of Berkeley's idealistic interpretation, man has to be conceived as a mere receptive *tabula rasa*; as a kind of potential *camera obscura*; in fact, as an invisible perceiver, whose visible embodiment is being continually composed of divinely emanated ideas, and who is disporting himself in a perceptual world composed of the same immaterial stuff.

It has been asserted by eminent authorities that Berkeley's reasoning is flawless. But is it not a sufficient *reductio ad absurdum* when such reasoning necessarily leads to the conclusion, that our persistent seeming body consists in reality of divine ideas flashed in fitful gleams upon our percipient mind, and belonging therewith no more intimately to ourselves, than to any other being who may likewise happen to perceive it?

This wildly speculative conception would seem to unsophisticated minds all too fantastic to be seriously entertained. But as thoroughgoing Idealists do not shrink from accepting even this extravagant outcome of their theory, the exact flaw in Berkeley's, as indeed in all purely idealistic reasoning, shall be definitely pointed out in the course of this discussion.

The sensation-philosophy, this psychological counterpart of the mechanical theory, with its pseudo-mechanical grouping of sensorial elements, consistently and unflinchingly expounded by Hume, stranded him inextricably, and to the great scandal of an illogical world, amid a matterless, soulless, godless, meaningless phantasmagoria of nothing but actual and remembered sensations.

No wonder that, under such complete ratiocinative volatilisation of our inner and outer being, and of everything besides, fervent souls were more than ever driven to seek communion with the perpetual powers through the ancient channels of direct emotional blending or of intuitive apperception.

Science, however, overrules mere emotional or intuitive yearning. With its logically consistent interpretation of carefully verified facts it carries intellectual conviction to all willing and capable of following the light of reason in its application to natural phenomena. Stimulated by the marvellous progress made in the interpretation of such phenomena under the sway of the mechanical theory, science

has been persistently striving to extend its mechanical dominion over all natural occurrences whatever.

The truth, that is, the full objective validity, of the mechanical theory once admitted, sound logical reasoning feels irresistibly compelled to look upon the course of nature in its entirety and in its minutest particulars as inexorably foreordained. Such course is then unalterably resulting from the primordial cast, from the initial positions and velocities of the elements that are obeying the mechanical laws. Or, otherwise expressed, all formations and activities in nature are then, and have ever been, the product of a definite amount of indestructible mechanical energy at work among the definite number of inert and indestructible elements that compose the substance of the things of this world, our own body among the rest.

All consciousness, all our sensations, thoughts, emotions, and volitions have, consequently, to be considered as a mere ineffective by-play to this purely mechanical actuation.

In vain do our philosophers seek to avoid this unavoidable conclusion. If the mechanical theory is—as generally *scientifically* believed—a correct interpretation of the actual state of things, then, inevitably, we ourselves are but conscious automata, with no power whatever to influence the course of nature, our own movements not excepted.*

* That out-and-out Automatism is the final verdict of a consistent interpretation, in accordance with our present mechanical science, has again and again been conceded by foremost scientific thinkers, from Descartes, Leibnitz, and Huygens to DuBois-Reymond, Helmholtz, and Wundt. Quite recently Haeckel, in *The Monist*, (Vol. II, No. 4, p. 484), does not hesitate to declare: "The so-called 'freedom of the will' is apparent only as each single volitional action is determined by a chain of precedent actions, which ultimately rest either upon *heredity* (propagation) or upon *adaptation* (nutrition). As these last are ('mechanically') reducible to molecular motions, the same holds true of the former."

More explicitly still: "The general science of nature assumes that in the whole world the same great, unitary, uninterrupted, and eternal course of development takes place, and that all natural phenomena without exception, from the motion of heavenly bodies and the fall of a rolling stone to the growth of plants and the consciousness of man, are governed by one and the same great Law of Causation;—and that all are ultimately reducible to atomic mechanics." (*Wissenschaft und freies Leben.*)

That even "the consciousness of man" is reducible to atomic mechanics, is more than most believers in the mechanical theory would admit. Haeckel, how-

If, on the other hand, we are—as we all *practically* believe—capable of directing our movements at will, and of thereby influencing the course of nature, then, most certainly, the mechanical theory is not a correct interpretation of the actual state of things.

There is no escape from this alternative. It has been the great standing dilemma ever since Gassendi revived the atomic theory and Descartes enunciated thereupon his dualistic world-conception: within us a mind filled with ideal phenomena; outside of us a realm of mechanically actuated matter; and no rationally conceivable interaction between the two.

Our own scientific thinkers are far, as yet, from having reached a sound monistic solution of this central problem. In fact, Du Bois-Reymond, with a full understanding of the import of mechanical necessity and a belief in its validity, has pronounced it insoluble. Professor Huxley, as a consistent *scientist*, is driven to admit that

ever, does not take the consciousness of man to be altogether an outcome of mechanical motion. Indeed, in his view it is hard to discover any connexion whatever between consciousness and atomic mechanics. For he endows the mechanically moved atoms or molecules with mental qualities. And this involves among other incongruities an utmost Dualism in nature. In fact, the same irreconcilable Dualism that has confronted thinkers since Descartes's time: Two parallel-running worlds, the one material, the other mental, and no possible efficient interaction between the two.

To call this thoroughly dualistic conception, nevertheless, "Monism," simply because no supernatural agencies are invoked, is surely to mistake its essential philosophical character. When Haeckel, moreover, declares that he regards all matter not merely as "besouled, that is to say, endowed with feeling," but endowed also "with motion, or, better, with the power of motion," he fundamentally upsets the entire mechanical world-conception he professes to uphold. For it is of the essence of the mechanical view that all motion be imparted from outside to inert matter. As Leibnitz already knew: in the mechanical order "*un corps n'est jamais mis naturellement que par un autre corps qui le presse en le touchant.*" Anything endowed with intrinsic power of motion would antagonise the mechanical order by introducing into it an incalculable, newly and spontaneously arising amount of energy.

Besides, by identifying "mind" with "force," by taking mind, as well as motion, to be a force-emanation, Haeckel's *Principles of a Consistent Unitary World-View* lead to further confusion. Mental states, as such, are utterly forceless, wholly devoid of mechanical momentum, and cannot, therefore, be a manifestation of force. They do not enter into the concatenation of mechanical activities. They are incapable of moving matter. They have no place in the mechanical theory.

These remarks are advanced to show what profound inconsistencies have yet to be cleared away in order to arrive at a "consistent unitary world-view."

the conscious-automaton-theory is indeed the necessary outcome of the mechanical view. As a *philosopher*, however, he resolutely shakes off the mechanical shackles and alights by means of a miraculous *salto mortale* a full-fledged Idealist into the opposite domain of inwardness. And Mr. Spencer, with his wonted many-sidedness, essays in vain sundry contradictory modes of overcoming this same dilemma.*

We desire to find explained, how in a world in which all change of position is held to be the strictly conditioned outcome of previously disposed and externally acting forces;—how in such a world it is possible for us to direct our movements by dint of intrinsically originated volition, becoming thereby enabled purposively to influence the otherwise rigorously necessitated course of a nature not forming part of our own being.

In the presence of the multifarious results of our nature-influencing capacity, it is nothing short of scientific fanaticism to profess disbelief in this power of ours over nature. For the sake of

* If Mr. Spencer's reasoning were throughout logically consistent, instead of eclectically latitudinarian, it would compel him, as well as Professor Huxley, to accept without compromise the mechanical view. The material universe with its "physical modes of force" preceded in the course of evolution its mental realisation. Mr. Spencer admits that the mechanical interpretation is the correct interpretation of physical phenomena. And with an adequate understanding of its implications he further admits that matter itself is inert, and that its ultimate units are devoid of any qualitative distinctions. All qualitative distinctions in nature must, consequently, be due to mere difference of arrangement. Mr. Spencer himself asserts: "The properties of the different elements result from differences of arrangement, arising by the composition and recombination of ultimate homogeneous units." This is, as Mr. Fiske emphatically corroborates, the Spencerian view of material phenomena, when these many-sided savants are speaking from the side of the physicist. And it is undoubtedly the mechanically correct view.

Wundt, in his *Theory of Matter*, emphasises likewise the same well-founded mechanical principles. He says: "The entire development of physical atomism points to the derivation of all qualitative properties of matter from the forms of motion assumed by the atoms. The atoms themselves are thus necessarily completely devoid of quality."

Inert, absolutely rigid, qualitatively and quantitatively undistinguishable elements, driven into sundry changeful arrangements by externally impelled modes of motion; this, and no other, is the veritable mechanical world-material. And thinkers who accept the mechanical theory are logically debarred from the device of endowing their atoms with any sort of qualitative property, or with any in-dwelling "power of motion."

intellectual integrity it will be well to keep this most essential philosophical problem clearly in sight until rationally solved.

The thought of the eighteenth century—swayed partly by mechanical materialism, partly by the sensation-philosophy, or in Germany by the Leibnitz-Wolfian compromise—was in all its phases essentially fatalistic, making of man an utterly powerless vehicle or plaything of strictly predetermined conditions.

Those among us, whose philosophising is running riot in the sphere of unimpeded idealistic licence, or who amid an overwhelming flood of contradictory philosophical opinions have lost the moral hold on logical consistency, can hardly imagine how helplessly fettered human consciousness felt by those rigid automatic theories of existence. Under such paralysing influences the transcendental idealism of Kant, however soberly guarded it may now appear to us, was hailed as an awakening from a profound lethargic slumber, as a joyous deliverance from the mechanical and dogmatic incubus that had so long oppressed human self-confidence.*

Kant convincingly taught that we are not merely perceptive mirrors, passively reflecting the marvels of an outside nature. But that, by dint of formative and constructive powers inherent in our own being, we ourselves fashion out of incoherent, sense-given data the entire world we are conscious of. And he taught, moreover, that, however much we may bodily and mentally be involved in the purely mechanical course of nature, our innermost being possesses, notwithstanding, the power of freely bending this otherwise rigorously necessitated course in conformity with the dictates of our moral ideal.

Ethical freedom, manifesting itself in intrinsic spontaneity of action—held however to be derived from a supernatural source—is what constitutes the central principle of the Kantian philosophy.

* This is what, among many other kindred expressions from contemporaries, the celebrated physician and philosopher Erhard has to say about the impression made upon him at the time by Kant's teaching : "Reading his works I shed tears of utmost joy. They made me realise myself as a rational being. I am who I am. No other person keeps control of my duties, or can do my thinking for me. The world I perceive is the problem for my knowledge ; my inner feeling of freedom alone the judge of my worth. And this I owe to thee, my master, my spiritual father."

And it is the principle that has mainly inspired the speculative systems which since that time have followed one another in such profuse succession.

It is this same nature-transcending principle of intellectual and ethical spontaneity, admitting on its inward side to close communion with a supreme Intelligence, and on its outward side empowering human beings rationally to transform the sense-apparent world ;—it is this same principle of spiritual freedom that with its thought-woven mirage is delusively alluring to the desert wastes of pure Idealism our numerous Neo-Kantians and Neo-Hegelians, our Transcendentalists and Theosophists.

It may be now fully admitted, without fear of serious contradiction, that whatever we are conscious of must, as such, necessarily be wholly a product of powers inherent in ourselves, and can by no means be a passively mirrored image of something existing outside of us.

Percepts arise in us in a compulsory manner. We generally attribute their origin to the things or objects we perceive as existing outside of us. But it is clear that the things or objects we are thus actually perceiving are products of our own perceptive faculty, are indeed the percepts themselves, and, as such, constituents of our own consciousness. Such percepts can therefore not possibly be—as generally believed—products, effects, or copies of the things or objects perceived ; for they are themselves these very things or objects perceived.

The entire wealth of our conscious world is wealth inherent in ourselves, constituting thus—as may be in a certain sense admitted—a gradually accruing self-revelation of that inmost nature of ours, which abides beyond the play of conscious states.

We have no immediate knowledge of this innermost being. That which we are immediately cognisant of is the product of its activity, the outcome of its shaping faculty, a becoming conscious of so much of its present manifestations.

In this light, all things or objects dissolve into fluent products of unremitting activity. And if the things or objects we thus perceive are—as maintained by Idealism—the real things or objects of

this world, then things or objects have no substantial, self-contained existence, but are altogether rainbow-like phenomena, produced and sustained from moment to moment.

It is incontestable that we are immediately conscious of nothing but a succession of most complex, ever-changing, ever-dwindling mental states, arising from the depths of our hidden nature. Or, if pure phenomenism deems it an as yet unwarranted assumption to assert that the conscious phantasmagoria arises from our own hidden nature, we are left with nothing for philosophical contemplation but the conscious content itself, or that which is directly revealed as conscious phenomenon.

The correct analysis, the rational interpretation of this conscious content will yield the true world-conception. All divergence of philosophical opinion is due to divergence in the interpretation of this single fact of world-awareness, of that, namely, which is consciously present. Into conscious presence is re-collected all past experience, is re-membered the totality of world-realisation.

The ever-changing conscious content reveals itself as the product of some kind of activity. And as, on account of its evanescent, ever-renewed existence, it cannot be conceived as self-actuated and self-created, it has to be conceived as an outcome of the activity of some agency not forming part of its own transient states.

Kant assumed that the producing agent of the conscious display is intelligence. And it is this purely idealistic position that has been so vigorously defended by Fichte and Hegel, and by their followers to the present day. According to this view, intelligence, and intelligence alone, is the creator of all world-phenomena, such phenomena having their existence solely in the conscious activity of this intelligence.

Kant, it is true, had taken for granted the existence of a world of things-in-themselves, affecting our sensibility, and filling it with the material made use of by intelligence in its world-construction. But it is clear that nothing can possibly enter the conscious content from an outer world. Its sensorial and perceptual, as well as its conceptual phenomena, are all in all constructed by whatever produces and sustains it from within. Therefore, if intelligence is

really the producer and sustainer, then intelligence is the only efficient power in world-construction, and the assumption of a realm of things-in-themselves is wholly gratuitous.

From the idealistic standpoint it is a mere delusion to believe that our senses are affected by anything existing outside the conscious content; for in verity there is no outside to it. All that consciously takes place in the world has its being in one and the same conscious content. This statement, when its meaning is fully realised, is indeed self-evident, admitting of no appeal.

But here the contrast involved in the idealistic view and in that of common sense, as seemingly revealed by perception, becomes strikingly apparent. Our individual being is generally held to be contained in what we call our body. And, moreover, it appears pretty evident that our entire consciousness is in some way an outcome of the activity of that particular part of the body we call our brain.

Now, when our body is consciously realised it often forms only a circumscribed and minute part of the entire world then consciously present. For instance, I at present perceive my body as a minute object within a vast landscape, consisting of a multiplicity of objects, and among them beings like myself. If the idealistic view is correct, if the percepts themselves are the real existents of this world, then our body—usually believed to be the bearer of the entire conscious content—forms, in fact, only an insignificant part of it. Consequently, instead of the conscious content originating within us individually, we, on the contrary, originate body and mind within the conscious content;—indeed, originate therein only as a comparatively insignificant part of it. It would follow therefrom that the conscious world we realise is the product of powers not forming part of ourselves. For our body, being only a circumscribed phenomenon among many others in the conscious content, this all-containing conscious content cannot possibly be a product of this or any other part of itself.

For the same reason, the conscious content, idealistically conceived, can neither be individual self-realisation, as Fichte had maintained, nor can it be an auto-cosmos, as the hylo-idealists will

have it. In fact, no sort of Solipsism is admissible under the idealistic assertion, that the conscious content is self-significant reality. The legitimate outcome of the idealistic position is objective Phenomenism.

The idealistic view in one form or another has got such firm hold on many of our foremost thinkers that it is by no means a waste of words to point out its unavoidable implications.

The conscious content, of which we ourselves bodily and mentally, together with all other things of this world, are integral parts, arises as a fluent phenomenon interruptedly and in fragments. It emanates as an ever-renewed, transient creation from a hidden matrix. This evident fact has led eminent thinkers, like Plotinus, Boehme, Spinoza, Schelling, and others, to declare that the source of existence is in its inmost nature unconscious.*

The phenomena of consciousness arise from a matrix not itself revealed in the conscious content among its constituent parts or states. Kant's "intelligible ego," which, as he maintains, never becomes an object either for the inner or for the outer sense, is an acknowledgment on his part of the existence of such an unconscious, or rather imperceivable, matrix. "Intelligence" or "Reason" are clearly only generic names given to the *conscious activity* of this hidden matrix. But such activity is not itself the matrix, as our Neo-Kantians and Neo-Hegelians are anxious to establish, in order—as Professor Caird asserts—to assimilate "man as spiritual with an absolute spirit."

Philosophy has thrown as yet no genuine, steadfast light on this obscure problem. Thus far we cannot say that the analysis of the conscious content has revealed the nature of the matrix whence it emanates. For it emanates just as little from any peculiar grouping of mechanically driven material particles, as from a purely spiritual activity.

* "The eternally Unconscious—that which constitutes the eternal sun in the realm of spirits is hidden by its own exceeding light; and though it never itself becomes an object, yet impresses its identity on all free actions;—this eternally Unconscious is at the same time the same for all Intelligences, the invisible root of which all Intelligences are mere factors." *Schelling (Werke, Ab. I, B. 3, S. 600).*

Let us, then, once more attempt to discover given data, that may help us to more positive conclusions concerning this inmost nature of our being. Such critical examination may perhaps at the same time enable us to overcome to some extent the central dilemma of matter and spirit, of automatism and spontaneity, of mechanical necessity and non-mechanical or so-called free causation.

No thinker, save an absolute Solipsist, will deny the existence of beings like himself. We have, however, seen why the solipsistic standpoint is logically untenable. There is, therefore, logically nothing to debar us from admitting the existence of beings like ourselves. We ask, then, how do we, and the Idealist among us, get to realise such existence? The latter cannot rightly maintain that he realises, for instance, the existence of his friend, as a purely ideal existence. He has absolutely no direct knowledge of the ideal nature of his friend. He is not in the least directly cognisant of his friend's sensations, thoughts, emotions, and volitions. These form in no way part of his own conscious content. What he is directly cognisant of, is the percept he calls the body of his friend. And it is solely by dint of perceptual or bodily signs that he indirectly infers that his friend is also a conscious being like himself.

It is undeniable, then, that his friend's ideal nature has no power whatever to affect the Idealist's perceptibility, so as to make itself directly known to him. It is incontestable, on the other hand, that his friend's non-ideal, non-conscious self has power to affect his perceptibility in most specific and distinct ways, so as to become directly known to him as the group of definite percepts he calls his friend's body.

Let us keep clearly in mind that nothing mental has power to affect the perceptibility of beholders, and that what is called our body is only a group of percepts in the conscious content of such beholders. It follows that our veritable self, the hidden matrix whence our consciousness arises, is of a nature altogether differing from anything manifest as mental or material. It cannot be like any of the mental phenomena casually found in our conscious content, not even like reasoning, or willing, or any activity we are directly conscious of. Neither can it be like the group of percepts

arising in the consciousness of him who perceives us, and which we call our body. It is consequently neither of the nature of mind nor of that of body.

It is, however, unmistakably, an existent that has power to arouse distinct perceptual realisations of itself in the consciousness of beholders. And it is an existent that is also the bearer of its own conscious content. It therefore has a nature incommensurably transcending in efficiency and import the group of percepts we call our body, as well as the group of other conscious states we more particularly call our mind.

Should the interpretation here given, despite its denial of the substantial existence of matter as a *perceived* entity, be nevertheless decried as "materialistic," there will be no objection raised to the use of this much-maligned term. The view here advocated is, indeed, essentially materialistic. Only matter must then be defined as that which affects our sensibility, awakening thereby definite percepts in our conscious content. And the usual mistake of looking upon the awakened percepts themselves as material objects must be avoided. For these are mere transient symbolical representations of the actual power-emanating existents. As such they form marvellously distinct and specific, yet wholly inadequate mental pictures. Looking at a brain, for example, how can the transient percept momentarily awakened in our consciousness, and consisting of nothing but differently colored surfaces, how can such a mere symbolical picture adequately represent the real existent, which science proves to have been most toilsomely elaborated during untold ages, and which contains all the gathered results of such elaboration?

And, as regards the functional activity of this highest achievement of material elaboration, how can its true import be at all realised merely by means of molecular agitation perceptible within its mental image? We know, however, that this same activity, which manifests itself to an outside observer as mere molecular agitation within his own percept, means incommensurably more to him whose brain is thus functionally active. Through such functional activity his world-revealing conscious content emanates from the inscrutable depths of his all-comprising being.

This being, though not itself of the nature of mental or conscious states, has such states as a functional outcome of some of its specific activities ; and though not itself of the nature of *perceived* matter, has power to awaken material percepts by affecting in specific ways the sensibility of beholders.

The realistic implications involved in this unmistakable state of things are almost universally shunned and dreaded. But are not the true facts of existence more profoundly marvellous than any fanciful conception of ours?

Our transient and forceless conscious content being but a functional outcome of the activity—not of what is perceptually known as our body and its brain—but of that hidden self of ours which awakens these definite percepts in beholders ; it follows that this hidden self is more fundamental, permanent and essential than any of its own mental states, or any set of percepts it may awaken in beholders.

In the light of what has been stated, it will not be difficult to realise, that, when I move my arm I cannot rightly say that the mental state I am conscious of as my volition has moved my arm. Nor can I say that the percept in him who witnesses the performance, and which he calls my body, has moved my arm. Both these modes of realisation : my own inner consciousness of the act, and the beholder's outer consciousness of it, are but mental symbols of the activity of my veritable being, my being which steadfastly abides beyond all conscious realisation.

Having thus but a symbolically inferential knowledge of activity, and but a symbolically inferential knowledge of that which is active, it is no wonder that the actuation of volitional movements, and, analogically, that of all other motion in nature, is so strangely enigmatical.

That much, however, may be clearly ascertained ; namely, that no kind of activity is purely mechanical. What Newton called *vis insita* in contradistinction to *vis impressa* plays a part of its own, indeed by far the most important part in nature.

The peculiar modes of reaction, of active resistance or intrinsic response, opposed by different kinds of matter to external impul-

sions, evinces the existence of specific indwelling powers. And it is these powers that underlie the perceptually realised qualitative properties of material compounds.

A wonderful amount of mathematical and physical ingenuity has been vainly expended by eminent scientists in order to bring reactive modes of motion under strictly mechanical laws. Elasticity, cohesion, chemical activity and union, gravitation, magnetic phenomena, muscular contraction, one and all have been tortured upon the mechanical rack without yielding the secret of their specific modes of activity.

To choose an extreme example of non-mechanical actuation, who can soberly contend, (though there have been mechanical enthusiasts that have gone even that far,) that the development of the chick in the egg is caused by the heat-motion imparted to it from outside. Is not the rigorously preconcerted rearrangement of the constituting material, which results in the formation of the chick, governed by most specific affinities inwoven in the reproductive germ?

During vital activity material elements are forced by compelling influences, emanating from the functioning substance itself, to fall into definite molecular arrangements. They are not forced to fall into such arrangements by dint of motion imparted from without. The functional agitation of the living substance is therefore not of the mechanical order.

In closely observing the functional activity of living substance it becomes visibly and unmistakably manifest that such activity is not of the mechanical order. It is not caused by the transfer of energy through mechanical impact. The constituent elements of the functioning substance are not driven together or asunder by externally imparted impulsion. What takes place on stimulation is, first, a chemical rupture, a so-called explosion, under which a definite organic molecule is severed from the original chemical totality of the substance acted upon. In consequence of this encroachment from outside a reaction sets in, spreading over a more or less extensive portion of the living substance, and resulting in a complete reintegration of its disrupted chemical totality. The living

substance restores its integrity by force of those most specific chemical affinities through which it is itself constituted. These enable it to fill the chemical or functional gap with complementary material assimilated from outside.*

The peculiar chemical or molecular constitution of the living substance is that which distinguishes it from other substances. And it is only through strict maintenance of this most definitely specific constitution that one kind of living substance is distinguished from another. Their reproductive germs, though microscopical and apparently all but homogeneous, contain evidently already with utmost faithfulness the distinguishing molecular traits.

Science has conclusively proved, that such marvellously specific and high-wrought chemical or molecular constitution is the result of endless elaboration. How then can the functional agitation of the living substance which aims at specific reintegration upon outside encroachment be of a mechanical nature? How can we feel justified in looking upon a molecular agitation which is directed with most punctilious selection by specifically ingrained chemical affinities as belonging to the mechanical order? Because we have experience of mechanical modes of motion, or rather because by excluding from consideration the specific constitution of bodies, and taking into account only their masses, we can reduce the motions imparted to them from outside to mechanical laws, it is vaguely hoped that these

* For calling this vital reaction and more especially that occurring during functional activity in the brain of higher organisms "hyper-mechanical," as I have done on former occasions, I have been censured by the Editor. This occurred probably under the impression that I meant by "hyper-mechanical" some super-natural agency here at work, while I only meant specific modes of motion originating from within, and transcending in efficiency any possible kind of mechanical display. The Editor himself is inclined to believe in activity originated from within. Such activity he will surely not call "mechanical." For it is of the essence of mechanical activity, that the acting substance as such be inert, and that all activity be imparted to it *ab extra*.

The arguments in this discussion do not apply to physicists who employ a working-hypothesis other than the mechanical. Such, for instance, as attribute to the material elements whatever attracting or repelling energies their calculation requires. Or such as discard all realistic assumption of matter and force, and confine themselves simply to the perceptual phenomena of interdependent motions, or such again as adopt the vortex-hypothesis, or assume some kind or other of ether-condensation, etc., etc.

same laws may be analogically applied even to such molecular modes of motion as are due to those specific relations between the constituent elements of bodies that impart to them their distinguishing characteristics.

Under the mechanical aspect "evolution" can mean only what its name literally implies; namely, the necessary unfolding of what is already potentially pre-determined in the initial disposition of that which is being evolved. There is no room here for any accession of power, for any specific modes of energy, for any genuine epigenesis, for any creative play or spontaneity of action. Everything the absolutely fatalistic outcome of mechanically moved matter.

This mechanical view of things cancels inexorably the significance and efficiency we so fondly attribute to that inner life of ours which we find revealed as the most intimate manifestation of our being. Our thoughts, emotions, and volitions are then a mere useless, foreign by-play to the mechanical evolutions of insentient matter.

This is the sorry predicament in which mechanical science seeks to place our unitary being, this world-revealing self of ours, that constitutes in all reality the memorial and epitome of the ceaseless travail of time-evolved creation. To find a scientifically consistent way out of the entanglements of such a monstrously inadequate interpretation of natural occurrences should constitute the foremost endeavor of philosophical contemplation.

Our foundation has evidently to be laid deeper than either what is usually called materialism, or what is called idealism. For materialism of the atomic and mechanical kind fails to establish any legitimate interaction between bodily activities and the corresponding mental states. And it moreover fails to leave a way open for the endowment of sense-affecting existents with intrinsic properties and forces, such as give rise to the specific qualities and spontaneous activities we perceive. Idealism of the genuine kind, on the other hand, is erected on an essentially erroneous pre-supposition, on the postulate, namely, that mind as such can affect mind, or rather that the mental states of one being can enter into direct intercommunication with the mental states of another being. And it further fails

to afford any sort of explanation for the sense-derived percepts by which that other being is consciously realised ; realised thereby solely as a bodily and not as a mental or ideal existent.

In the course of this discussion it has been shown that the perceptual realisation of matter in motion does only symbolically and remotely disclose the nature of that which is seen to move, hiding from view the veritable source of the activity thus perceived as motion. There has been found ample reason to conclude that the activity displayed by living beings, and symbolically perceived as their bodily movements, is a functional activity emanating from the non-mental nature of those beings ; from that nature of theirs namely, which has power to arouse representative percepts in beholders. And ample reason has further been found to justify the conclusion, that the molecular motion visible during such activity in the mental image or perceptual realisation is of a nature altogether transcending any possible kind of mechanical motion.

Analogically we may rightly conclude, that all existents that have power to awaken representative percepts in beholders, and this means all perceptible things of this world, are likewise potentially endowed with specific modes of activity, of which the phenomena of elasticity, cohesion, chemical selection and union, and so on, are manifest displays.

Nay, the very power of arousing definite percepts in beholders is, itself the most striking proof of specific, never-flagging activity on the part of the perceived existents ; an activity which constitutes their very nature, and on account of which these sense-stimulating existents may well be called specific power-complexes.

The incalculable factor of newly arising modes of specific activity, which gives to "evolution" its true significance, is evidently introduced into nature by a more or less incidentally occurring combination of material elements. These combinations acquire thereby as newly formed compounds also newly arising specific properties of their own. And this means that they react in new and specific ways on being influenced or acted upon by surrounding existents.

Reaction by dint of specific, indwelling efficiency plays, as already stated, a far more important part in nature, than causation

understood as an external producer of effects. Material compounds, as they become more and more highly elaborated, oppose more and more specific modes of reaction to outside influences. And when in the living substance specific modes of reaction have become functionally attuned to specific modes of stimulation, then that significant play of interaction between organism and environment supervenes, which gives us rightly the impression of being purposive or teleological.

Considering what ceaseless vital toil, what slowly moulding interaction with a specific environment, carried on unremittingly during untold ages, was actually required to elaborate higher forms of conscious beings; how can we well conceive the consciousness of these beings, thus gradually evolved, and obviously only the outcome of functional activity; how can we feel justified in conceiving it as a separate and finally independent entity?

The activity of our being which gives rise to the emergence of an idea, say the idea of some definite movement to be executed, would in an outside observer awaken the perception of an infinitesimal molecular stir originated in some minute cerebral structure. And this molecular stir would be seen by the observer to spread along definite nerve-tracts until it reached the motor organs innervated by them. Here a voluminous molecular agitation would be incited, accompanied by contraction of the entire muscular substance. This motor function would by the outside observer be perceived as purposive movement, while it was being felt by the performer himself as voluntary activity.

The same activity incited, not by the performer's own initiative, but by some external influence, would not be felt as voluntary, but merely realised as automatic. This kind of automatism would be, however, by no means of a mechanical, but strictly of an organic, nature. It would be produced by intrinsic and specific modes of activity.

The difference between voluntary and automatic activity of the organic kind can be distinctly realised by watching, for example, our breathing movements. These are generally carried on automatically and unconsciously. By directing our attention to them

we, however, become conscious of the automatic activity. This is a genuine instance of conscious automatism; for there is no effective intercommunication between the movements and the awareness of them. The activity that underlies the conscious state, and the activity that underlies the perceived movements, are only concomitant and not interdependent. But we are, moreover, able to assume voluntary control of the movements. We can, at will, breathe quicker or slower, deeper or less deep, or entirely inhibit the movements for a time. The consciousness of this voluntary performance compared with the consciousness of the mere automatic action will clearly indicate the difference between spontaneous and automatic activity. Here the two activities have entered into effective intercommunication. The activity that underlies the movements has become dependent on the activity that underlies the conscious volition.

The complete volitional control we have over the movements of those muscular apparatuses that minister to our life of outside relations constitutes in the executive department of our being that freedom of activity, which enables us to transform the given opportunities of nature in compliance with our ideal purposes.

We may, then, finally and legitimately conjecture, that an existent, which under functional excitation becomes conscious, though it cannot itself be of the nature of any of its conscious states, must nevertheless as their all-containing potential matrix be considered as mentally endowed; must, in fact, be the bearer of the organ of mental awareness. And we may further legitimately conjecture that, what by means of inadequate symbolical representation is revealed to perception as our bodily organisation, is in all reality the existent that under functional excitation of its central organs becomes conscious.

The activity felt by us as voluntary is in verity the outcome of a spontaneous exertion on the part of our symbolically revealed, but otherwise hidden being. We hold spontaneous sway over the movements of the organs that minister to our life of outside relations. We control the use of our limbs, moving at will and manipulating with purpose the existents of the outside world. We voluntarily

incite or inhibit the movements of our sensory organs, thereby foreseeing the revelations or attesting the validity of our tactile impressions. And we intentionally innervate the movements of our vocal organs, communicating thus to our fellow-beings the experience these same articulated movements have enabled us to rationalise.

It is by force of such motive control that we are free and not automatic agents.*

EDMUND MONTGOMERY.

*After having for years in my deficient way urged the task of scientifically overcoming the mechanical or necessitarian theory, in order to arrive at a monistic conception of our own nature and the world at large, it is highly gratifying to find that so eminent a scientific thinker as Professor Peirce has, on entirely different and far more precise grounds, reached the same all-important conclusion.

THE NERVOUS CENTRE OF FLIGHT IN COLEOPTERA.

IS IT possible to know the physiology of an organ, that is to say, its functions, signification, and purpose, from a simple study of its anatomy? Eminent authors have said no to this question. Claude Bernard, the greatest physiologist of the century, especially, has contemned the assistance of anatomy in the understanding of the phenomena of life, and his ideas are generally accepted, having passed as authoritative into the standard works on the subject. To a great extent, this position is the correct one. It is incontestable that the majority of physiological discoveries have been made by physiology. I propose, however, to show that this rule admits of exceptions, and that we can, in certain circumstances, where it is impossible to resort to vivisection, apply the method of comparative anatomy to the solution of very nice problems of nervous physiology.

The philosophical interest of this method will make ample recompense for the dryness of details which the study of the nervous centre of flight in *Coleoptera* presents; for this is the investigation of which we are now about to give a sketch. We announced some time ago our intention to do this, in an article published in Vol. III, No. 1, of *The Monist*, where we sought to sketch the outlines of the normal structure of the ganglion.

It will be well, perhaps, briefly to recall at the outset the general disposition of the wings and the nervous system of *Coleoptera*. We know that these insects possess two pairs of wings, which are inserted in the dorsal face of the thorax. The posterior pair alone

serve for flight. They are composed of a fine, transparent membrane, supported by delicate nervures. The anterior wings, which are called "elytra," are sheaths of greater or less powers of resistance, sometimes speckled with bright colors, covering the wings when at rest and protecting them after the manner of a buckler. When the animal takes to flight the elytra spread, so as to permit the membranous wings to unfold.

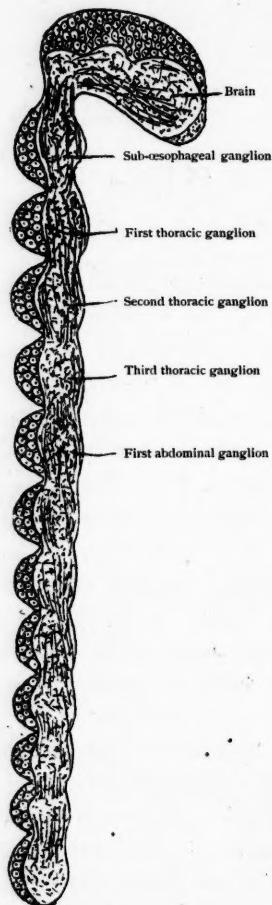


Fig. 1.—Schematic longitudinal section of the nervous system of a larva of a dipteran.

Each of these two organs is joined by a rather large nerve with the nervous system of the insect. This nervous system, which is of a quite complex character, is composed of a brain situated in the head, whence a nervous ring, encompassing the digestive tract, proceeds. This nerve-ring connects the brain with a chain of nerves that extends beneath the digestive tract the entire length of the ventral face of the insect and widens into a series of ganglia. This chain of nerves forms what is called the sub-intestinal nervous system. We may obtain some sort of an idea of this system of organs by casting a glance at Fig. 1, which represents the nervous system of the larva of a dipteron.

The first ganglion of the sub-intestinal chain is called the sub-oesophagean; it innervates the buccal parts and is usually located in the head of the animal. The second, third, and fourth ganglia, in the adult insect, are usually situated in the thorax; they are called the thoracic ganglia. These ganglia send out the nerves to the three pairs of

feet; they are consequently the locomotor ganglia. Next comes the abdominal chain of ganglia, which furnishes nerves to the cells of the abdomen and to the genital regions.

At present, the thoracic ganglia chiefly interest us, as these furnish the nerves of the wings and elytra. These ganglia are three in number. The first is not connected with the apparatus of flight, and, consequently, does not interest us; the second supplies the nerves of the elytra; and the third, the nerves of the wings.

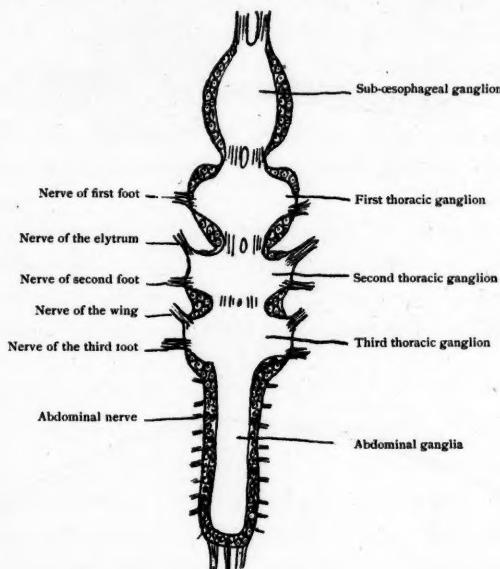


Fig. 2.—Schematic horizontal section of the sub-intestinal nervous system of *Rhizotrogus*.

The appended cut, which represents a horizontal section of the sub-intestinal nervous system of a coleopter (*Rhizotrogus*), shows the series of ganglia which we have just described, with the nerves that proceed from it. It will be noted that the second and third thoracic ganglia give out, respectively, the nerves of the elytra and of the wings.

This is a synopsis of the knowledge which the dissection of an insect with the scalpel furnishes us; to obtain any knowledge of

the internal structure of a ganglion, we are obliged to resort to the method of sections, which consists in cutting up an organ in slices sufficiently thin to allow of their being studied in a transparent form under the microscope. In any *section* of a ganglion, taken in any plane, it will be seen by such an examination that the small mass of nervous substance constituting the ganglion is always composed of the two following parts: a central part, of considerable size, composing three-fourths of the ganglion and made up of fibrillar sub-

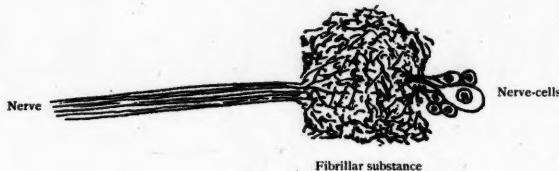


Fig. 3.

stance; and about it a second part, formed of nerve-cells, the number and size of which vary with the place. These cells give out prolongations, which lose themselves in the fibrillar substance. It is a conclusion to which precise researches directly point, that the

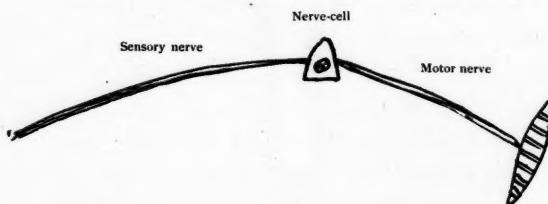


Fig. 4.

nerves which lead to a ganglion do not end directly in the cells, but in the fibrillar substance; and similarly the axial prolongations of the cells do not directly continue into the nerves, but are also lost in the fibrillar substance. This is schematically represented in Fig. 3. It will be at once seen that this histological arrangement greatly differs from the plan of the reflex arc (Fig. 4), which is now everywhere described, but is probably very inexact. According to the plan usually given, the sensory nerve ends directly in the nervous cell, which reflects the excitation to the motor nerve. The

nervous excitation follows a path presenting no solution of continuity. But, as a fact, in insects there is something interposed between the nerve and the nervous cellule, and this something is the fibrillar substance, which is made up of a skein of fibres so complicated in structure, that it is hopeless to attempt to disentangle it. Consequently, we are in total ignorance as to whether a continuity exists between the nerve and the cell, or whether the excitation is not otherwise propagated between the two points.

Leaving aside this important question of nervous histology which is now occupying the attention of a host of observers, let us follow the alary nerve into the interior of the ganglion and see how it acts towards the organs which the ganglion contains. We shall now be obliged, in the interest of clearness, to say a few words concerning the internal organisation of a thoracic ganglion, but we shall

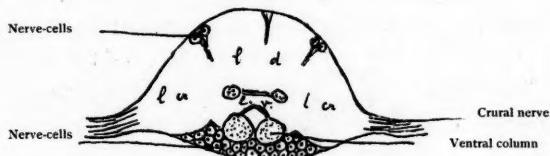


Fig. 5.—Schematic transverse section of a thoracic ganglion of an Insect.

restrict ourselves in this to what is absolutely necessary to an understanding of the plan of the alary nerve, and shall accordingly reproduce, very briefly, the substance of our preceding article. A thoracic ganglion may be regarded as made up of the following three distinct parts (in this description we shall only occupy ourselves with the fibrillar substance) : a ventral lobe, a dorsal lobe, and, laterally, of two crural lobes. The crural lobes are connected with the nerves of the feet ; these we shall not discuss. A difference of the dorsal and ventral lobes is seen at once by a glance at their fibrillar substances. This substance is quite tenuous in the dorsal lobe ; while in the ventral lobe it is very dense, clearly outlining a special organ to which we have given the name of *ventral column*. In Fig. 5, which is a transverse section, we see, at the sides, the two crural lobes (marked *l. cr.*), in which the nerves of the feet end ; higher up the dorsal lobe ; and, beneath, the ventral lobe, which displays a cir-

cular section of the two ventral columns. And in the longitudinal section (Fig. 6), that is to say, in a section parallel to the flanks of the animal, the ventral column appears in its characteristic form of a column elongated along the ventral region of the ganglion; and above it in the dorsal lobe will be seen the connective filaments which traverse the ganglion longitudinally, and extend throughout the whole subintestinal nervous chain. Finally, a horizontal sec-

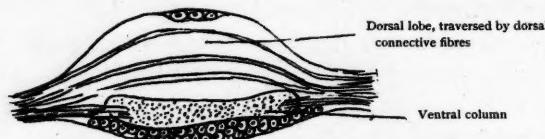


Fig. 6.—Schematic longitudinal section of a thoracic ganglion of an Insect.

tion, made parallel to the ventral face of the insect, shows that the ventral column is double and symmetrical. There exist, in fact, two ventral columns, situated one on each side of the median line;

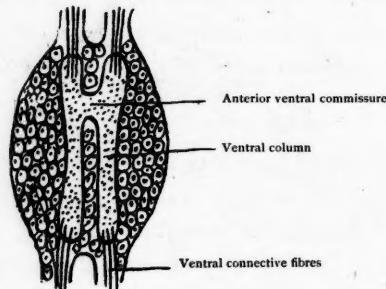


Fig. 7.—Schematic horizontal section of a thoracic ganglion of an Insect, showing the two ventral columns.

and this duality is evidently in some way connected with the primitive duality of the ganglion, which is developed in two distinct parts (Fig. 7).

The path of the alary nerve into the interior of the ganglion is sufficiently defined by these details. This nerve, considered for example in the cockchafer, penetrates the lateral regions of the upper face of the ganglion; then, after having passed the conjunctive envelope of the ganglion, it emits its extremely slender first root

which enters the upper parts of the dorsal lobe where it is accompanied throughout its entire course by a great number of tracheæ, amid which it is scarcely discernible; this is the *upper dorsal root* of the alary nerve. Then the trunk of the nerve continues its oblique course and descends; it traverses the bed of nerve-cells which surrounds in this region the fibrillar substance, and penetrates that substance. At this point it is subdivided into two roots, both much larger than that which we above described. The first of these roots

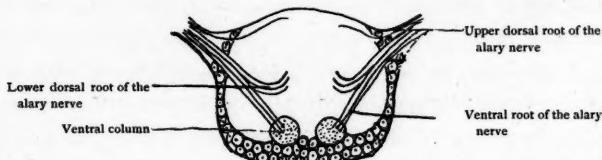


Fig. 8.—Schematic transverse section of a thoracic ganglion of a coleopter, showing the three roots of the alary nerve.

describes the small arc of a circle curved concavely upwards and rises again towards the dorsal lobe of the ganglion. This is the *lower dorsal root* of the alary nerve. The other makes directly towards the ventral column, which is its ultimate destination. This

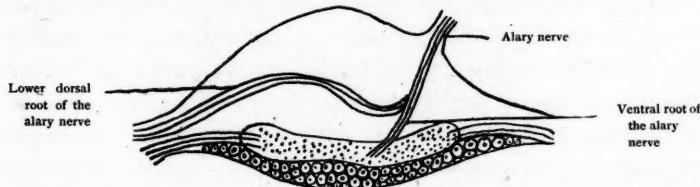


Fig. 9.—Schematic longitudinal section of a thoracic ganglion of a coleopter showing two roots of the alary nerve.

is the *ventral root* of the alary nerve. The disposition of these three roots is distinctly seen in a suitably taken transverse section like that of Fig. 8.

In some types of *Coleoptera*, for example, in the horn-beetle, it has been found that the ventral root is double. To determine the course of the lower dorsal root, which we have good reasons—to be mentioned later—for regarding as the characteristic root of the alary nerve, we must follow its path in an appropriate longitudinal section, i. e., in one which is slightly oblique (Fig. 9). In such a sec-

tion we find that this root crosses the ganglion from the front to the rear and enters the succeeding ganglion, which is the third thoracic ganglion. Here, all knowledge which microscopic anatomy furnishes us concerning the roots of the alary nerve ceases. Can we go any further, can we learn anything concerning the function of these roots?

We already possess some interesting facts concerning the physiology of the thoracic ganglia of insects. These facts are due to the fine and precise researches of Faivre, a naturalist as eminent as he is modest, who has, perhaps, not yet acquired the full reputation which is his due. Faivre has long studied, with a sort of predilection, the genus *Dytiscus*—the coleopter of marshes and swamps, the water-beetle, which owing to the facility with which it may be procured at all seasons, and also owing to its large size, seems almost predestined for vivisection, and may be almost regarded as the frog of the invertebrates. Faivre has minutely studied the properties of all the nervous ganglia, of the connective filaments, of the nerves, and even of the stomato-gastric system of this animal. He is ignorant of the internal structure of the parts on which he experimented. The method of sections was not practised at that period. He simply connected the effect of the irritations, punctures, and experimental lesions which he made with the exact point that had been injured. He has traced, thus, a *topographical physiology*, the precision of which in my judgment is admirable, as every time that I have repeated his experiments I have arrived at exactly the same results. We shall not speak here of his researches on the stomato-gastric system, nor of those on the brain, in which he defined the boundaries of the motor centre of the antennæ at a time when men were still ignorant of the existence of the deuto-cerebrum. We shall simply restrict ourselves to a recapitulation of the results obtained by him in his experiments on the thoracic ganglia.

Guided doubtless by the idea of an analogy between the functions of the sub-intestinal nerve-ganglia of insects and the functions of the spinal marrow of vertebrates, Faivre sought to discover whether the outermost peripheral face of the ganglion of an insect was not endowed with especially sensitive properties, and the face

farthest inwards with especially motory properties. We need scarcely recall to the reader's attention the well-known fact that in insects, viewed in the natural position of locomotion, the nervous system of the thorax and the abdomen is sub-intestinal, while in vertebrates the nervous system is situated wholly above the digestive tract, and that, consequently, the face of this system which is nearest the periphery of the body is ventral in insects and dorsal in vertebrates; in other words, the development of the nervous system which is effected in parallel lines in the two types of animals at the expense of the ectodermal layer, takes place for the sub-intestinal ganglia of insects in the ectoderm of the ventral regions, and for the vertebrates in the ectoderm of the dorsal region. The result of this disposition is, that the ventral face of the ganglion of an insect is the homologue of the dorsal face of the spinal marrow; and Faivre has effectively shown that these two faces are possessed of the same sensitive properties.

The experiments of Faivre bear especially on the movements of the feet, which are quite easy to observe, and which are much more varied than the movements of the wings or the elytra. The experimenter first established that the sensibility of a foot and its powers of motion can be destroyed separately. Lesions or simple irritations may be made, so localised that the same foot when excited directly will remain at rest, but when the irritation is made elsewhere, on another foot, or on an antenna, or on the pecten, will move with vivacity. The interpretation of this case is that the foot, not responding to direct excitations, has lost its sensibility, but conserved its powers of motion. Conversely, the lesions may be so localised that a foot will remain absolutely motionless and inert in all cases, as well during direct excitations of itself or other feet as during spontaneous movements of the animal, yet the localisation be such that by irritating this foot a motor effect is produced in other parts of the body. In this case sensibility is preserved but the power of motion lost.

It is possible, thus, notwithstanding the opposite opinion of a number of modern physiologists, to destroy separately each of the two functions sensibility and motion, which are not so indissolubly connected as is generally supposed.

To produce these two inverse effects Faivre found, after many attempts, a precise place for the lesion. The best means appeared to him to be a slight pressure with a flat lancet on one of the faces of the ganglion. The compression of the dorsal face, or a very superficial puncture of that face, or the insertion of the blade under the perineurium produces simple motor paralysis without anaesthesia; the compression of the ventral face produces anaesthesia without loss of the power of motion. The last symptom, it seems, is more difficult to provoke, and it is necessary to take great pains in not overdoing the compression if we wish to obtain an anaesthesia wholly free from movement. Let us add that these phenomena of paralysis are frequently transitory and disappear in a few hours; but their duration is sufficient to admit of exact observations, which gain the conviction of the experimenter. We have continued the experiments of Faivre by a new method, which we shall not enter into here, and have found results which are absolutely exact.

We now propose to show that we can arrive at the same conclusion by comparative anatomy. To discover whether this organ is motory, and that sensory, we may dispense with physiological experiments and replace the scalpel by the microscope. Without making a lesion, which destroys the natural disposition of the organs, we can, by simply describing the microscopic section, read in that section the physiological significance of certain structures. This method of comparative anatomy goes much further, it seems to me, than that of Faivre. In the first place, it is more precise, as it replaces an experiment, that is to say, a transitory phenomenon, of which soon afterwards only the memory is left, by the observation of a permanent preparation. Further, the vivisections of Faivre referred only to a part or region and not to an organ. To establish that the ventral face of a ganglion is sensory is only an approximate result. What internal organs of a ganglion does this face comprise? Where does it stop? And as many more questions, to which no answer can be given by the scalpel. But comparative anatomy, as we shall see, is not content with pointing out the sensory region; it also determines the organ and the nerve.

Let us see, now, how this anatomical demonstration can be ef-

fected. We have directed our attention to certain coleopters which present the interesting characteristic of possessing wings and of not making use of these for flight or for any other movement. An appellation is wanting for these coleopters, and we have accordingly supplied them with one: Aptesids, from *a*, privative, and *ptēsis*, flight, to point out their chief deficiency, which is not the lack of an organ, but of a function. Our examination is restricted to three of these coleopters of quite different families, namely: *Blaps mortisaga*, *Timarcha tenebricosa*, and *Carabus auratus*.

In these three species the membranous wings are wanting. The elytra exist, but are immobile and generally soldered together at the median line. These organs conserve their office of affording protection for the abdomen. There is a curious instance of disassociation here between sensibility and motion; the elytrum has remained sensory, but has lost the power of motion.

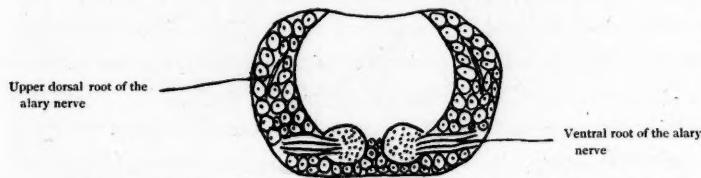


Fig. 10.—Schematic transverse section of the second thoracic ganglion of *Timarcha tenebricosa*.

It is natural, then, that we should seek the extent to which this physiological modification has affected the internal structures of the ganglion. The idea of such an investigation would never occur to us, if we did not know that insects of the same order are comparable one with another, and if our studies had not already informed us that a thoracic ganglion, for example, has much the same organisation in all coleopters. We can, then, legitimately suppose that the roots of the alary nerve present the same disposition in a coleopter that flies and in a coleopter that does not, and that the differences which may exist between the two cases should be attributed to the physiological modification referred to.

Let us now cast a glance at a transverse section, seen in Fig. 10, of the second thoracic ganglion of *Timarcha*. We see that the

roots of the alary nerve have suffered considerable reduction. The upper dorsal root subsists. The ventral root also subsists, with important diminutions, which we already know about. The suppression continues to the intermedial root and to the lower dorsal root, whose strange course we have described above.

We have not traced this root on the drawing, because we have not been able to find it in our preparations. Has it wholly disappeared? We shall not answer this question in the affirmative. It is sufficient to cast a glance at the tangled mass of fibres of one of these preparations,—which our drawings always simplify and schematise,—to understand how dangerous it would be to deny the existence of fibres which could escape the most practised eye. Still, a negative result should, with reservations, always be admissible. The only conclusion to be insisted upon is—and this conclusion is quite sufficient to serve as the basis of our physiological deductions—that if there exist in the ganglion of an apteric coleopter fibres representing the lower dorsal root of the alary nerve, these fibres must be greatly reduced in number and in importance, for while a lower dorsal root is discovered with great facility in a ganglion which possesses the power of flight, here these fibres are not at all distinctly discernible. If, at some future day, by means of more perfect technical methods, we succeed in clearly distinguishing these fibres, it will yet always be exact to say that the loss of the power of flight in *Timarcha*, *Blaps*, and *Carabus* is especially indicated in the lower dorsal root, and that consequently this root should be considered as motory in character.

This is the main conclusion which we are now in possession of, and one which will serve us as a point of departure for a whole series of deductions. But, before accepting it, it will be best to seek the criticisms which can be advanced in connexion with it.

If the lower dorsal root is motory, the ventral root is sensory; these two conclusions are inseparably connected. We may ask, in this connexion, what can be the nature of the slender root which goes to the upper dorsal region of the ganglion, and which exists in *Timarcha*. It is too far removed from the ventral root to be endowed with sensory properties. Should it be considered motory?

This supposition appears to be contradicted by the fact that the elytrum is immobile and has no need of a motor nerve.

This slight difficulty of interpretation appears to us to find its solution in a remark which must be made concerning the constitution of the alary nerve. This nerve is not wholly composed of fibres which go to the wing; branches proceed from the alary nerve, which distribute themselves in the walls of the body. The alary nerve is thus a nerve at once alary and parietal; and it is probable, therefore, that the upper dorsal root belongs to the parietal fibres.

It now remains to be known how the alary nerve is represented in the third thoracic ganglion of the apteric coleopter. The third thoracic ganglion supplies the nerves of the membranous wings. These latter, we have said, are wanting in *Timarcha*, as also in two other apteric coleopters. Fig. 11 represents a transverse section of

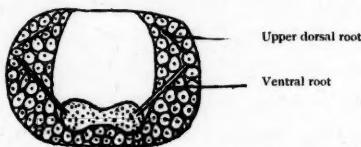


Fig. 11.—Schematic transverse section of the third thoracic ganglion of *Timarcha tenebricosa*.

the third thoracic ganglion of *Timarcha*. It will be seen that the alary nerve is represented here by two roots, exactly as in the second ganglion; only,—and the difference is one of great importance,—that while in the second thoracic ganglion the ventral root of the alary nerve is very voluminous, here, in the third ganglion, it is much attenuated.

Now, keeping this feature in mind, it appears that we may compare this nerve in its attenuated form to one of the parietal nerves which we found in the series of the abdominal ganglia. The abdominal nerves are apparently composed of two slender roots of which one extends into the upper parts of the dorsal lobe, while the other terminates in the dorsal column. The resemblance is indeed so perfect that Fig. 11 might represent indifferently a section of the anterior region of the third thoracic ganglion and a section of the abdominal ganglion.

This permits us to make, in passing, an instructive comparison between an abdominal (or parietal) nerve and the alary nerve. These two types of nerves have a common root, the upper dorsal root. They also have a quite analogous second root, the ventral root, which is thin in an abdominal nerve, but quite voluminous in an alary nerve. What characterises the latter, is the presence of the lower dorsal root, which is not represented at all in an abdominal nerve. We may say—neglecting slight differences—that the alary nerve is an abdominal or parietal nerve, to which a lower dorsal root is added.

This resemblance seems to us confirmed in a very distinct manner by an observation which we have made on the thoracic ganglia of the larvæ of *Coleoptera*. We were curious to know in what form an alary nerve appeared in the larvæ, which, as is well known, possess no wings. Fig. 11 could also represent, just as faithfully, a section of a larval thoracic ganglion taken at the level of the anterior region; that is to say, the alary nerve is represented in the larvæ by a parietal nerve. Again, embryogeny supplies a further confirmation of these deductions, by showing us that the wing is not, like the leg, a real appendage, but is produced from the wall of the zonite, which at the points where this development does not take place is innervated by a parietal nerve. But let us leave these incidental considerations and return to our main subject.

We may consider it for the present an established fact that the alary nerve has a sensory root, namely, the ventral root, and a motor root, namely, the lower dorsal root. This conclusion, we see, is in perfect accord with the experiments of Faivre, who has established that the ventral face of the ganglion is endowed with sensitive properties, and the opposite face with motor properties. Our conclusion goes much further, for instead of referring us to a province that is undefined, it points out to us with absolute precision a tangible bundle of nerve-fibres.

Knowing the nature of these fibres, we can, by examining the lobes in which they terminate, learn by inference the physiological properties of the lobes. It is thus that the ventral column receiving the sensory fibres must be considered as an organ of sensation, while

the dorsal lobe which receives the motor fibres is certainly a centre of motion.

This is not all. Observation shows that the fibres that traverse the ventral column from the front to the rear do not fuse in the connective filaments with the fibres that traverse the dorsal lobe of the ganglion. The inference from this is that the dorsal region of the connective filaments is motory, and the ventral region sensory.

Continuing our deductions, if we examine the brain of the insect, we shall observe that it includes a region, the fibrillar substance of which has the same loose texture as the dorsal lobe of a sub-intestinal ganglion, and also a second region where the fibrillar substance is as dense as in the ventral column. Owing to the cephalic curvature, these regions present a substantially different disposition, and the ventral region of the sub-intestinal ganglion is represented in the brain by the anterior region; similarly, the dorsal region of the sub-intestinal ganglion becomes the posterior region in the case of the brain. These homologues, vague as they at first may appear, possess at least the interest of showing that in the most complex ganglia of the nervous system of insects, in those ganglia that are incontestably the seat of high psychical functions, we find the same divisions of sensory and motory centres.

We shall close by remarking that there exists in the brain of insects a very large body on which anatomists have bestowed the name of pedunculate body, but whose functions, despite some curious observations, have hitherto remained an enigma. It is regarded as incontestable that the pedunculate body is an organ of psychical functions, as it only exists in the first brain and is not in connection with the nerves of special senses; and also because, as the beautiful researches of M. Forel on ants have shown, the development of this body seems to be greater in proportion as the insect is more intelligent. Our studies of the alary nerve make an important addition to the ideas hitherto held on this subject. In view of the fact that the pedunculate body belongs almost entirely to that region of the brain which we may consider sensory and which is the homologue of the ventral column, we believe it can be maintained that the pedunculate body is a sensory organ. ALFRED BINET.

HEREDITY VERSUS EVOLUTION.*

AN INVESTIGATION.

WHEN Dr. Prosper Lucas published his work on "L'hérédité naturelle," in 1847, which was the first attempt to create the science of heredity, he established his theories on the metaphysical basis of two laws, one of spontaneity, by which nature tends freely to create and invent, and the other the law of heredity, by which nature tends subordinately to imitate and repeat her creations. He pursues this philosophical discussion through fifteen hundred pages, but his facts are so largely given on hearsay evidence that his book has little scientific value. He gravely cites the case of a Jew who could read the contents of a book through its covers without opening it, and says his son inherited this remarkable power. Yet Dr. Lucas's work no doubt gave the name to the study which has in the last few years become so important. Galton, in England, followed Lucas, but on a much higher level, in his "Hereditary Genius," 1865. Ribot, in France, made a considerable advance in his book on "Hérédité." Such works form a class by themselves. They constitute the necessary stage of theory and assumption through which the study has passed to its present more scientific period.

The word "heredity" had not been anglicised in Darwin's time, and consequently he discussed the subject, as did Galton,

* This paper was read recently before the Anthropological Society of Yonkers, New York. For the purpose of exactness, the writer has made free use of his authorities, and the claim to originality, if any, rests on the grouping of the subject, the point of view from which it is considered, and the application of the principles advanced.

under the more correct word "inheritance." The transfer of the word to English is, it would appear, due to its use by Herbert Spencer, who either adopted it from some less known writer or took it direct from the French. In either case, he began its use without referring to the source to which he was indebted for it, or explaining critically its meaning.

Thus formally introduced as a scientific word, first, in the French by Lucas, and then in the English by Spencer, it gained an immediate and wide-spread acceptance, under the rule that it is legitimate to take a word out of its ordinary and familiar use and give it a special meaning in scientific discussions.

The definitions now given by various writers are in part as follows:

Weismann says: "The word heredity, in its common acceptation, means that property of an organism by which its peculiar nature is transmitted to its descendants." Again, "Heredity is the process which renders possible the persistence of organic beings throughout successive generations." Ribot defines its meaning as "that biological law by which all beings endowed with life tend to repeat themselves in their descendants. It is for the species, what personal identity is for the individual." Herbert Spencer, carefully following Ribot, defines it as "the law that each plant or animal produces others of a like kind with itself." Romanes says more accurately, "The great principle pervading organic nature, which is seen so mysteriously to bind the whole creation together, as in a nexus of organic affinity, is now understood as nothing more or less than the principle of heredity." Again, "We know that the characters of parents are transmitted to their progeny by means of heredity." He also speaks of "the large class of known facts and unknown causes which are conveniently summarised under the terms heredity and variability."

While these definitions show us its meaning, they also reveal how closely allied heredity is to evolution, and an examination of the definitions of the latter indicates that the two words are almost interchangeable. Evolution is defined by Romanes as the "theory of a continuous transmutation of species"; by another writer as "an

explanation how all existing species may have descended from one or a very few low forms of life," or how "existing forms of life have descended by true generation from preexisting forms," or as Professor Huxley gives it, "the hypothesis which supposes the species living at any time to be the result of the gradual modification of preexisting species." Evolution, in short, is a theory of descent. Heredity also has as its only topic "descent," and it inevitably leads us to a discussion of similar investigations, theories, and lines of thought. Though they treat of the same subjects, there are differences to be noted in the methods of treatment adopted.

Evolution may be said, in the words of Weismann, to be "a merely formal explanation of the origin of species, while heredity is an attempt to discover the real and genuine explanation." He adds that investigation "brings out clearly the speculative character of the whole hypothesis of evolution. Darwin only asked what was necessary to assume in order to explain this or that fact in heredity, without troubling himself to consider whether the assumption were borne out by facts or not." This is a fair deduction from the words of Darwin, where he writes, "the principle of natural selection may be looked upon as a mere hypothesis." Also, when he pointed out that his hypothesis of pangenesis was "merely provisional" and "an expression of immediate and by no means satisfactory knowledge of these phenomena." "Ideal theories," says Weismann, commenting on this frank acknowledgment, "are by no means useless. They are the first and often indispensable steps which we must take on our way to the understanding of complex phenomena."

Evolution is a theory, an hypothesis, an inspiration, and as with all the revelations which have come to mankind, the statement precedes the practical proof, which is taken up afterwards when the exhilaration, the divine afflatus, of the original conception has subsided. Then cold common sense takes the place of enthusiasm and the dissecting table, and the microscope the place of the pleasures of composition.

The comparison may be summed up in the antithesis that evolution is a theory of descent, and heredity the science of descent.

As we have found that the definitions and scope of evolution

and heredity are similar, so we may notice that the discussion of their fundamental propositions run parallel, and they both begin with the affirmation and denial of the same proposition. Evolution in its modern development is held to have taken its rise from the hypothesis of Lamarck, that the effects of use and disuse are inherited. Heredity may be said to have become a science when Weismann in his famous lecture denied that acquired characteristics are transmitted.

The transmission of the effects of use and disuse is the fundamental proposition of Lamarck. Existing forms of life, says Lamarck, have descended by true generation from pre-existing forms. Use and disuse produce development and atrophy of organs, and on this principle he based his theory of the transformation of species. Darwin also made prominent use of this theory, though he greatly amplified it by his hypothesis of natural selection. Spencer distinctly returned to it. He rested his whole system of biology, and in a conspicuous manner his "Data of Ethics," on the Lamarckian hypothesis of the transmission of the effects of use and disuse. His revival of this theory gave rise to the term Neo-Lamarckian. These hypotheses were only a development of the teachings of Lamarck and rested on his fundamental doctrine.

If the conclusion of Weismann be true, evolution is only the outgrowth of inherent and not added or acquired faculties, and the relation between one generation and another that of a trustee and not of a parent or creator.

If it can be proved that "the heredity tendencies" as claimed by Weismann "are transferred from generation to generation, at first unchanged and always uninfluenced in any corresponding manner by that which happens during the life of the individual which bears it, then all our ideas on the transformation of species require thorough modification, for the whole principle of evolution as proposed by Lamarck and accepted by Darwin, entirely collapses." Professor Osborne, of Princeton, has said, "if from the evident necessity of a working theory of heredity the *onus probandi* falls upon the Lamarckian—if it be demonstrated that the transmission of acquired characteristics does not take place, then we are driven to the

necessity of postulating some as yet unknown factor in evolution to explain the purposive or directive laws in variation." Weismann prefaces his "Lecture on Heredity" with the explanation that in it he "treats only of the transmission of acquired characteristics which has hitherto been assumed to occur," and adds that "the inheritance of acquired characters has never been proved either by means of direct observation or experiment." Pflüger also, in reference to the arguments in favor of Lamarck's theory, says, "Not one of these facts can be accepted as proof of the transmission of acquired characters."

These are broad statements, for Spencer had adduced these facts, in support of transmission: the diminished biting-muscles of lap dogs, diminution of jaws, crowded teeth, blind cave-crabs, the neck of the giraffe, the development of the aesthetic faculties, inherited epilepsy in guinea-pigs; and Darwin had rested his argument on a learned mass of scientific facts, such as the reduced wings of birds of Oceanic Islands, drooping ears and deteriorated instincts, wings and legs of ducks and fowls, pigeon wings, shortened breast bone in pigeons, shortened legs of rabbits, blind cave-animals, inherited habits, tameness of rabbits, short-sight in watchmakers and engravers, larger hands in laborers' infants, and inherited mutilations.

All these questions are discussed and ably treated by William Platt Ball, in his book "Are the Effects of Use and Disuse Inherited?"—in which he takes the negative. He finds in natural selection and panmixia a sufficient explanation of these phenomena. In reference to the giraffe, he quotes Darwin as saying, natural selection alone "would have sufficed for the production of this remarkable quadruped."

It was a great work for any man to undertake single-handed to reverse the received opinions of the scientific world on so fundamental a proposition as the transmission of acquired characteristics, and yet the opinion is now gaining general acceptance that this work Weismann accomplished, so that now the position he announced first in his "Essay on Heredity," which appeared June 21, 1883, has been received and accepted by the leaders of the evolutionary school. A. R. Wallace, who shares with Darwin the dis-

tinction of the first promulgation of evolution and natural selection, expresses his acceptance of Weismann's dogma of the non-inheritance of acquired characteristics in these words. "We cannot therefore accept any arguments against the agency of natural selection which are based upon the opposite and equally unproved theory that acquired characteristics are inherited, and as this applies to the whole school of Neo-Lamarckians, their speculations cease to have any weight." Prof. Ray Lankester writes, "It has never yet been shown experimentally that anything acquired by one generation is transmitted to the next."

Mutilations have been inflicted upon men and animals for centuries, such as flattening the head, boring the ear, tattooing the flesh, mutilations for ornament and as religious ceremonies, and yet not the slightest effect is thereby produced upon new generations of men and animals. The feet of Chinese women are normal, the bandaging for generations has not produced the slightest diminution in their size. Experiments have been made upon mice extending over a thousand specimens by cutting off their tails, without changing the form of that member in succeeding individuals. No child was ever born who knew how to read or talk or play on the piano. The instances which are narrated of the transmission of acquired characteristics are found upon examination to be idle tales, chiefly provocative of mirth, as when Weismann remarked on being told of the transmission of the marks of a broken leg, that it was strange the scar did not arrange itself in the form of an inscription "to the memory of the fractured leg of my dear mother."

To understand the scope of the dogma of Weismann we must distinguish clearly what is meant by an "acquired characteristic." Some diseases are transmitted, for instance, tuberculosis and smallpox; but a microbe which is supposed to be the foundation of these and other hereditary diseases, is not an acquired character. It is simply a parasite. Weismann defines an acquired characteristic as "a local and sometimes a general variation which arises under the stimulus of external influences." He gives the name of "somatogenic" to the characters which take their rise in the "soma" or

body, and "blastogenic" to characters which belong to the germ or type.

The doctrine is that no changes of the characteristics relating to the body and no mental acquirements which are not inherent in the type of the parent can be transmitted. As Burns sang—"A man 's a man for a' that," and the disadvantages as well as the advantages of surroundings, the polish, refinements, and acquirements of wealth and education, as well as the rudeness and ignorance of poverty are not transmitted. This doctrine only can explain the facts of life. From the common people and from the aristocracy alike, spring leaders of thought and men of action. There is no warning or intimation given of the advent of genius, and where we look for it, it is not found. The question then arises, what is the cause of the preservation of the type unchanged not only from generation to generation, but from one geological period to another? Why do offspring resemble their parents in not only general, but particular features? To account for these phenomena, the various theories have arisen regarding the germ as the sole bearer of life.

Weisner remarks that theories of heredity have always adopted units invented for that purpose, so that the composition of living matter out of very small units has become one of the fundamental points of such a theory.

That the world and all that it contains is composed of minute particles is a theory as old as Democritus who first propounded the atomic theory four hundred years before Christ. The discussion which began in his time against his theory and in favor of that of Anaxagoras who believed in the continuity of bodies and that all matter which had extension was likewise susceptible of division, has continued even down to modern times. Descartes denied the atomic theory. Leibnitz, on the other hand, regarded his monad as the ultimate element of everything.

When the microscope became developed into a serviceable instrument, in the middle of the seventeenth century, the Dutch philosopher Leeuwenhoek first discovered the corpuscles in the blood. But the imperfections of microscopes caused their use to be almost entirely neglected, until in 1832, when owing to the great improve-

ments in their construction, minute structural anatomy has been if not created anew, at least thoroughly revised. John Goodsir laid great stress on the office of the nucleus in the growth and reproduction of cells. Virchow still further developed the idea of the cellular structure of the animal organism. Hugo Van Mohl, and after him, Max Schultze designated the contents of the cells of vegetable and animal organism as protoplasm.

Ernst Brücke (1861) was the first to maintain the existence of small vital particles. He did not give them a name, but he opposed the old theory of cells and showed that their bodies must possess organisations quite distinct from the molecular structures of organic compounds.

Herbert Spencer considered that the whole organism is composed of what he called "physiological units," in all of which he says there dwells the intrinsic aptitude to aggregate into the form of that species.

Darwin followed with the theory that each cell of a living body possesses the power of giving off invisible gemmules or atoms, and these "gemmales are conveyed into the blood and thus circulate through the body."

Galton then wrote denying the circulation of the gemmules and substantiating his denial by satisfactory proof.

Elsberg introduces (1874) the term "plastidule" to designate the hypothetical ultimate particles of which protoplasm is composed.

Weismann began in 1883 to introduce his idea of germ-plasm, maintaining that the body which nourishes the germ-cells is only an outgrowth of one of them.

Nageli in 1884 attempted a mechanico-physiological explanation of the theory of descent. He calls his ultimate particle a "micella," which he defines as a minute crystal, microscopically invisible. In 1889 a writer named De Vries developed a theory of heredity in a paper on "Intracellular pangenesis," in which he substituted for Darwin's gemmules the ultimate vital particles which he called "pangenes" which are the bearers of the constituent qualities of the species.

But it is left to Weismann to develop a theory of germ-plasm

and continuity of life which carries the minuteness of organisms to a point beyond which it would seem impossible to go. Weismann is a microscopist, and he shows his reliance upon the microscope in the study of questions of heredity when he says, "I have not been able to make out by my own observations the correctness of these views as to the ancestral units, my impaired eyesight, which has so often put a stop to microscopical investigations, has again rendered the continuation of these researches impossible."

The most important of Weismann's doctrines, the non-transmission of acquired faculties, we have already alluded to; we now approach a second, the continuity of life. His researches in connection with these two discoveries elevate him to the highest rank among biologists, and a word may not be out of place regarding his style. He is a most satisfactory writer, for he never hesitates to express his belief as it is at the time of writing. The scientific caution of Darwin is entirely lacking in him. His constant and emphatic use of the words, "I believe," is a rebuke to the wishy-washy indifferentism which agnosticism has made popular, and sets a fine example of sincerity and independence to all who discuss scientific subjects. He is not writing for effect or to establish a theory, but to discover the truth. He has no weak pride of self-consistency, and chronicles his change of belief with unaffected simplicity and freedom. He abounds in trenchant epigrammatic statements, which carry conviction of their sincerity, if not always as to their truth.

In a word, his theory of germ-plasm is three-fold. By a long process of reasoning and investigation, he arrives at the conclusion that there is, first, a comprehensive physiological unit, which represents the ideal of the individual, whether a plant or animal. This he calls the "id," the first syllable of ideoplasm. It is the architectural thought of the individual. There is, second, the determinant, a unit which controls the method and direction of the development of the individual, which might be called the will if metaphysics had not gone out of fashion. Each "id" in the germ-plasm is built up of thousands or hundreds of thousands of determinants. Lastly, there is the biophor, the life-bearer, the smallest and most multitudinous of all the units. The number of possible kinds of biophors

is unlimited. These three units, somewhat similar in characteristics to body, soul, and spirit, constitute the historic, architectural, ancestral germ-plasm, or model from which the individual is formed. By means of a microscope the eye can see one of four thousand lines in four-tenths of an inch; but in size these biophors are inconceivably beyond the power of the microscope. In a human blood corpuscle squared there might be 703,000,000 biophors. Professor Mivart says, "I confess I do not believe such a collocation is possible." But these multitudinous aggregations allow the supposition towards which Darwin, Spencer, Weismann, and others have inclined that there are just as many independent and variable parts in the germ-plasm as exist in the fully formed organism. Under the power of the determinant, a single biophor might be developed into the skin of half the face, for instance, and as there are thousands of millions of biophors in each individual, the combinations of developed characteristics become infinite, and it is practically impossible for any two individuals to be alike. The circumstances, forces, conditions, accidents, as we call them, of life, or, as some say, the environment, compel development or restrain it, and produce an endless variety. But this variety is one limited by historic and inherent blastogenic characters. The multitude of biophors seems required not only by the individual, but by his descent. The characteristics of the immediate parents, as developed in the offspring, are inconceivably numerous; but if, as we believe, there has been an upward development from lower to higher orders, the characteristics possessed by a long ancestry of all these forms of life must be represented. An explanation of reversion and atavism is thus offered. Sickness, health, accidents, favorable or unfavorable surroundings will control the development of the biophors, and thousands of millions will never be called into activity, while those which are developed will determine the character of the personality which will result.

Thus the biophors representative of near or remote ancestors may be developed in any individual. Camoens, the epic poet of Portugal of the sixteenth century, not only fascinated his countrymen with the charm of his poetry, but also by his dazzling beauty

as a pure blonde, descended from and surrounded by a swarthy race. A single biophor might have floated down to him from some unrecorded ancestor, or even more remotely still from some yellow-haired animal, and, by an occult cause, have been so developed in him as to control his whole personality.

Shakespeare expresses and exhausts the thought when he puts into the mouth of a slave of Cressid this description of Ajax :

"This man, lady, hath robbed many beasts of their particular additions ;* he is as valiant as the lion, churlish as the bear, slow as the elephant ; a man into whom nature hath so crowded humors that his valor is crushed into folly, his folly sauced with discretion. There is no man hath a virtue that he hath not a glimpse of, nor any man an attaint, but he carries some stain of it."

This is the whole science of heredity anticipated by two hundred and fifty years.

But this variety is limited by historic and inherent blastogenic characters, and consequently development takes place within a prescribed range. Outside of this range is infertility. Each species is therefore sharply circumscribed on all sides by the doctrine of non-transmission and the continuity of life. Yet the evolutionist assumes to account not only for one species, but for all, and for all the changes by which the unicellular organism is differentiated into the multicellular.

Evolutionists of the extreme Neo-Lamarckian school, of whom Herbert Spencer is an example, if not the leader, account even for the existence of well developed moral sentiment and the feeling of obligation, the oughtness, by the Lamarckian principle. In his letter to John Stuart Mill, Spencer writes : "Moral intuitions are the results of the accumulated experiences of utility." He speaks in his "Data of Ethics" of "the inheritance of the effects of the pleasurable and painful experience in progenitors," which is the basis on which his whole psychological view rests. If there is no transmission, then, as Wallace said, "his speculations on the subject cease to have any weight," and the source of the feeling of oughtness can-

* Shakespeare here and elsewhere uses the word "additions" in the sense of characteristics.

not be utilitarian, empirical, and evolutionary, but must be inherent, intuitional, and blastogenic. The existence of native moral sentiments is confirmed by the earliest known writers, by the tenderness of Buddha towards human suffering, by the provision of the Jewish law, "thou shalt not seethe the kid in its mother's milk," by the writings of Catullus in Rome's most cruel era, and in modern times by the aptitude of savages to become civilised.

Let us ask, what effect has the theory of the continuity of the germ-plasm on the other theories we have been considering. Evidently it corroborates and confirms the non-transmission of acquired characteristics, for it proves that the germ is ancestral and historic, and it builds up an individual well furnished with capacity for development, as we used to say, or with biophors, which may be called into activity or lie dormant as the determinants may elect or circumstances require. Incidentally it excludes stirpiculture, and it shows the necessity of the education and amelioration of every successive generation and of every member of each generation, as the only means of race improvement. It shows that the parent is a trustee and not a creator, in which it follows the teaching of the highest scientific authorities. And finally, it shows that if evolution is to stand, some new principle must be adduced in its support, as was said by Professor Osborne; for the trend of non-transmission and continuity only teaches that all things must have continued from the beginning of their creation as they are.

There are two rival hypotheses to account for the differentiation we see in the organic world. Evolution, in the various forms in which it is held, and special creation in its varying shades of acceptance. The evolution of Lamarck and Spencer need not be referred to as that has already been sufficiently considered.

Evolution by natural selection is the solution advanced by Darwin and his school to account for variation, the origin of species, and the upward progress visible in the organic world: while the vast conservative majority, which learns slowly and moves cautiously, replies, on the authority of the consentient opinion of mankind, it is rather development by special creation.

Let us, then, get an understanding of these two theories from

definitions given by those who are authorised to speak. Weismann says: "Charles Darwin and Alfred Russell Wallace have taught us to understand by natural selection that process of elimination effected by nature itself, without the aid of man." Darwin himself says: "The term natural selection is in some respects a bad one, as it seems to imply conscious choice." Again: "For brevity, I sometimes speak of natural selection as an intelligent power. I have also often personified this power, for I have found it difficult to avoid this ambiguity." Again: "The principle of natural selection may be looked upon as a mere hypothesis." These definitions were enunciated when natural selection was first advanced to complete the theory of evolution. Professor Romanes, of Oxford, claims to have been a student of evolution for thirty years, and we may therefore learn from him the views held by the generation of Darwin's adherents who have followed him. He says: "Nature, so to speak, selects the best individuals out of each generation to live. As men by selection slowly but continuously improve their stock, so nature, by a similar process of selection, slowly but continuously makes the various species of plants and animals better and better suited to the condition of their life." Weismann, on the other hand, says: "Such a view is not strictly correct, for retrogression and degenerate forms play an important part in evolution." "There is no reason," continues Professor Romanes, "why we should set any limits to which this process is able to go."

He then condenses the arguments in favor of natural selection into four "facts," as he calls them. It must appear from the reading of these so-called "facts" that to so designate them is a peculiar use of language. They are theories, not facts. The first "fact" is the necessity for selection, because any one form of life would dominate the world if all its descendants were allowed to live. Does this theory not rather prove the necessity for the limitation of increase by destruction, the use of animals as food, and infertility? For food purposes the best specimens are selected, and this process would tend to deterioration. The second "fact" is this: "Nature is therefore always picking out or selecting the individuals best fitted to live." This theoretical process is therefore done by nature,

and not by the individuals themselves. The third "fact" is: "Individuals so selected transmit their favorable qualities to their descendants." If transmission is accepted, which theory is contrary to the teaching of Weismann's school as far as it applies to qualities acquired during the life of the individual, it must be allowed that unfavorable as well as favorable qualities may be handed down. The fourth and last "fact" is plainly on its face a theory. Professor Romanes says: "Our common mother, Nature (personified by a capital *N*), is able to distinguish between all her children. When an individual variation gives to that individual a better chance in the struggle for life, Nature (again with a capital *N*) chooses that individual to survive, and so to perpetuate the improvement in his or her progeny." Weismann has given the name Panmixia to the freedom all organisms possess to survive and commingle their variations. Panmixia intervenes therefore as a disturbing element, to prevent any orderly carrying out of the upward progress of natural selection, and to restore all variations to the architectural ancestral type.

In the next sentence Professor Romanes writes: "Now, I say that all these several component parts of Darwinian doctrine are not matters of theory, but matters of fact." Let us see where these facts lead him to, for it is probably in a different direction from that in which he desires to go. He personifies nature as an active, intelligent agent, ruling over organic life with a definite purpose, acting as a man does in cultivating his herds. He describes the individuals as selected without the exercise of their own volition for a purpose, and that is to make the various species better. On page after page he contrasts what he calls "the two rival theories of evolution and special creation," and in fact this comparison may be said to be the subject-matter of his book. Yet, when he comes to discuss the subject of natural selection, he is obliged to take refuge in a form of expression, which is only to be explained by the acceptance of the rival theory of special creation, which he is endeavoring to overthrow. Who is our common mother Nature? Why did he not give us a scientific definition of her? Where is her abode? How does she exercise her discriminating powers over her children?

He evidently has faith in mother Nature, in her wisdom and power and justice and goodness and truth. She must be, from his description, infinite and eternal and unchangeable.

After this, we read with a smile the last pages of his book, where he claims that "evolution has rendered the mechanical interpretation of nature universal," and where he thinks "the religious mind has suddenly awakened to a new and terrible force in the words of its traditional enemy, 'Where is now thy God?'" Professor Romanes will have to rewrite his anthropomorphic pages on natural selection, if he wishes the ordinary reader not to take his closing words as a *non sequitur*.

We can add to these explanations of Darwin and Romanes other meanings which are attached to the word Nature:—thus to the fortuitist it means chance, to the materialist it means the chemical and physical properties of matter, to the agnostic it means simply the play of forces in the organic and inorganic world, and to the theist it means a personal Creator. It becomes, therefore, a very convenient word, a symbol to which each one may attach his own particular meaning, and use it without compromising his views. It enables us to avoid Professor Lankester's sneer at American evolutionists, in that they have conspicuously abandoned the scientific method.

Having considered the views of Darwin and Romanes on natural selection, it remains to consider those of Weismann.

Professor Weismann does not disguise the difficulty he meets in attempting to incorporate the doctrine of natural selection into his theory of heredity. He walked upon firm ground when he was laying the foundation of his theory of the non-transmission of acquired characteristics. He has proved that doctrine beyond his power to recall it. But the task he has set before himself is to produce a complete system to account for the origin of species, and, like Darwin, he turns to natural selection, and says that the individual differences, caused by the various development of biophors, form the material out of which natural selection produces new species.

All his readers will assent to his remarks which follow this statement. He says :

"At first sight this conclusion appears to be very startling and almost incredible, because we are inclined to believe that the continued combination of existing difference cannot lead to their intensification, but rather to their diminution and gradual obliteration. Indeed, the opinion has already been expressed that deviations from the specific type are rapidly destroyed by the operation of reproduction."

This willingness to argue against his established convictions smacks of the pleader and not of the judge, and exposes Weismann to the criticism which he passed upon Darwin, and suggests the suspicion that he is only seeking what is necessary to assume in order to complete a system of heredity. Thus we see that Darwin, Romanes, and Weismann all progress bravely with their theories until they reach the crucial point of accounting for the origin of species. Then Darwin falters, and says natural selection is a bad term, that is, that it expresses on its surface the thought he wishes were true, but his scientific knowledge requires him to give it a meaning under which the thought breaks down. So Romanes, who is a faithful follower of Darwin, makes a break which is far more conspicuous. And then Weismann, returning to the same attack, and animated by the same purpose, actually surrenders the fruits of his greatest victory rather than acknowledge that there is conscious action in nature.

We see, from this difficulty which besets the path of these great thinkers, the true source of the strength of the theory of special creation. It accepts all that science has to say as to methods and chronology and development and evolution as a process, and when the point is reached where other theories break down, it offers the simple solution of the existence of a personal creator.

I must confess to much surprise when, to learn the most recent position of those who favor evolution, I took up Professor Romanes's book last summer and read his confession that there are but two rival hypotheses to account for the origin of species, evolution and special creation. For confession it must be called after all the arguments, scientific proofs, raillery and sarcasm, which have been ex-

pended in its overthrow. Spencer closes his chapter on the special creation hypothesis in these words :

" Thus, however regarded, the hypothesis of special creations turns out to be worthless—worthless by its derivation ; worthless in its intrinsic incoherence, worthless as absolutely without evidence ; worthless as not supplying an intellectual need ; worthless as not satisfying a moral want. We must therefore consider it as counting for nothing in opposition to any other hypothesis respecting the origin of organic beings."

Remembering this attitude, which was originally taken by Spencer in 1852 and reaffirmed in 1864, and expecting rather to read in Romanes's book his belief that now all the thinking world was of one mind and that special creation was a forgotten myth, I say I was surprised instead of that to read that it was the one rival theory of evolution, and I said to myself, What, not dead yet, and after so many funeral orations ? Surely this theory has a wonderful vitality.

A word must therefore be said of the present position of the doctrine of special creation.

It is the old belief contained in the words of Cicero—*Deus mundum aedificavit*,—God built the world. The fundamental idea of the special creationist is that of a conscious power working in and over nature. It is not against evolution or epigenesis, but against fortuity, chance, or spontaneous generation, or materialism, or the chemical theory. It is well described by Weismann in writing of Lamarckianism : " An ideal theory, an indispensable step which we must take on our way to the understanding of complex phenomena." It is a theory which personifies nature as Professor Romanes has done for us, and accepts natural selection in the sense Darwin and Wallace have taught us to receive it, as the selection by nature. It is held by educated men, not in the form satirised by Spencer, in that essay of his which Darwin so heartily applauded, but as a theory which answers more questions, solves more doubts, and raises more veils than any other which has ever been propounded by man. Though heavily weighted with the accumulated ignorance and superstition of all the ages, it is still the rival theory, because of such admissions as the following of Weismann : " I admit that spontaneous generation, in spite of all vain efforts to demonstrate it, remains

for me a logical necessity." And "I hardly think we shall ever reach the point of explaining vital processes by means of the well-known chemical and physical properties of matter, but until the explanation is proved to be impossible, it will in my opinion be unjustifiable for science to relinquish the attempt." Special creation therefore stands on the same footing as any scientific theory, as spontaneous generation, or materialism, an unprovable hypothesis, and yet to the vast majority of mankind a logical necessity.

We have now considered in rapid survey the theory of the non-transmission of acquired characteristics, of the germ-plasm and the continuity of life, of natural selection and the rival theories of evolution and special creation.

It remains to be asked what are the relations of these theories to each other, when brought together in the science of heredity, and it must be seen that if non-transmission and the continuity of life be accepted, then selection by nature and special creation coalesce under the definitions given them, and evolution becomes merely a description of the process and not of the power which accounts for the origin and variation of species.

A collateral result of the conclusions of heredity may be to shorten the world-chronology which it has been the fashion to lengthen indefinitely, and to modify but not supplant the fundamental biological and psychological beliefs of the ages.

THEODORE GILMAN.

SÉBASTIEN CASTELLION AND RELIGIOUS TOLERATION.

ONE of the last Frenchmen whom I met before starting from Paris in April was M. Ferdinand Buisson, Director of Primary Education in the Ministry of Public Instruction, a leading authority in France on all pedagogical questions and one of the founders of the public school system of that country. On leaving him, he presented me with two magnificent volumes* devoted to the humble life and lofty labors of Sébastien Castellion, the Franco-Swiss teacher, author, theologian, and reformer, one of the earliest and most fearless apostles of religious toleration ; and he suggested that I give wider publicity to this work in the English-speaking world. This biography deserves indeed to be better known among us, both on account of the author and the subject ; and hence the writing of this article, which is based mainly on a review of the work from the pen of Prof. Alfred Rambaud.†

In his Preface, M. Buisson says : " Ten times interrupted and each time for a long interval, the book was never entirely abandoned even when the author might have despaired of ever finishing it." Begun in 1865, the labor was not completed till last year. It was a heavy task. The study of the materials was in itself Herculean. Countless printed or manuscript documents which had to be examined were scattered through the libraries of cities, universities, and

* *Sébastien Castellion, sa vie et son œuvre (1515-1563), étude sur les origines du protestantisme libéral français*, 2 vols. in-8°. Paris, Hachette. A copy of this work will be found in the library of Cornell University.

† See *Revue Bleue*, Tome 50, No. 6.

churches in France, Germany, Holland, and Switzerland. The bibliography of Castellion's writings, giving their various editions from the middle of the sixteenth century down to our own day, and embracing their translations into all the tongues of Europe—this alone was an undertaking of no ordinary kind. In a word, as one of the reviewers truly says, "this book is a veritable encyclopædia of the Renaissance and the Reformation."

Who was Sébastien Castellion? M. Rambaud answers the question as follows on the authority of M. Buisson. We are told that he was one of the most learned humanists and professors of the sixteenth century. A Latin school book which he compiled had much the same success in Europe in those days as Webster's spelling-book has had in our own country during the present century. I refer to his "*Dialogi Sacri*" of which M. Buisson has unearthed not less than one hundred and thirty editions issued between 1543 and 1791, and to be found in all the important cities of Switzerland, Germany, and the Low Countries, in London, Edinburgh, and Dublin, and even in Spain and Hungary. His Greek and Latin poems, his translations from the Hebrew, Greek, and Latin, delighted the humanists of his time, while his translations of the Bible into Latin and French were events in the religious and literary worlds of that age. But the originality of Castellion lies in the private evolution of his religious mind, the affirmation of two or three great truths which he was among the first to proclaim, which he was among the most determined in supporting, and which mark him as one of the founders of several great Protestant sects and one of the earliest precursors of liberty of conscience.

Sébastien Castellion was born in 1515 in France near the Swiss frontier and studied at Lyons, then a famous seat of learning. When the Reformation burst upon the world, the little group of Lyonese humanists, who counted Castellion among their number, was immediately split in twain. One division submitted to Rome, but the second, to which Castellion belonged, revolted. What finally decided him to break with the old church was the terrible spectacle of the execution of heretics. In 1536, Jean Cormon, a peasant of Bresse near the birthplace of Castellion, perished in the flames

simply because he had colporté the Bible. In 1538 Castellion learned that a book-seller, Jean de Lagarde, and a Toulouse student, had met a similar fate in Paris. Martin Gorain was drowned at Grenoble in 1536, while the following year witnessed the burning of several heretics in various parts of France. Finally, in Lyons itself, the very *alma mater* of Castellion, Cardinal de Tournon gave to the flames four poor souls in January, 1540. These cruel butcheries pierced the very heart of Castellion.

Up to this time the exact doctrine and meaning of the Reformation was not absolutely clear to Castellion nor to many others who were wavering like himself. But when, in March 1536, Calvin's "Institution Chrétienne" appeared, the Reformation became more definite in Castellion's mind. From that moment he may be said to have become a Calvinist. This book and the *autos-da-fé* decided his vocation. In the spring of 1540 he went to Strassburg and lived under the same roof with Calvin, paying his share of the expenses, it should be noted, and becoming one of Calvin's most devoted disciples. Calvin was then thirty-one years old and Castellion was his senior by three or four years. When the former was recalled to Geneva, the latter followed him and became, in 1541, the head of a college there. Then it was that Castellion published his "Dialogi Sacri" and began his translations of the Bible. He now desired to become a minister, but as he would not accept Calvin's interpretation of certain portions of the Bible, the latter refused to allow him to take holy orders. Castellion thereupon decided to break with Calvin and quitted Geneva. Thus began the struggle which is still going on between Liberalism and Orthodoxy.

When Castellion left Geneva he of course had to give up his college professorship which furnished himself and family with bread, and was consequently plunged into the deepest poverty. He applied for a position in the college of Lausanne. But there was no vacancy there. He moved on to Bâle where he became proof-reader in a printing-office belonging to one Oporin. His salary was so small, however, that, in order to have any fire at home, he had to fish out the wood found floating down the Rhine. But this terrible struggle for material existence was not the only burden he had to



bear. Calvin's hatred followed him everywhere. The public letters of the Genevese autocrat were widely circulated and all of them contained extravagant denunciations of Castellion. Finally, in 1552, this martyr to freethought found a momentary respite and became Reader in Greek at the Bâle university. Though he still lived in the most frugal manner, the wolf was no longer at the door. But this bitter experience did not weaken Castellion's moral courage. At that very moment he was girding his loins for a still fiercer struggle with his enemies in the church.

When Calvin put to death Servetus, only two men in all Helvetia dared lift up their voices in public protest. One of these was, of course, Castellion, who, notwithstanding the fact that Calvin had many and powerful friends in Bâle and that he endangered his newly-acquired position at the University, came out in a bold manifesto. It was indeed published under an assumed name—Martin Bellie—but everybody knew who the real author was. In order that his pamphlet should obtain the widest possible publicity, he issued it in both Latin and French, dedicating the first to the Count of Hesse and the second to the Duke of Würtemberg, whose dominions had accepted the Lutheran Reformation. This act brought down upon him a new storm.

When Castellion gave to the world his "De Hæreticis" and his "Traité des Hérétiques"—the pamphlets just referred to—his enemies had not yet forgotten the two prefaces which he had placed at the head of his Latin and French editions of the Bible. These were the first manifestos published in favor of liberty of conscience; the "De Hæreticis" and its French version were the second. This latter work went through many editions at Magdeburg, Strassburg, and other European cities. It was also known as the "Farrago Bellii," because of the mass of texts which it contained, borrowed from the early fathers, the chief reformers, from Luther himself, and all of which advocated toleration. Even Calvin was represented by one text, rather equivocal however, in which he preaches the employment of "science and not force," and in which he speaks of "the celestial melody of the Holy Ghost." Bèze, the *alter ego* of Calvin, answered Castellion in a pamphlet, which declares that it is

the right and duty of the Church to put heretics to death. This was the old doctrine of Rome and the Spanish Inquisition. All this made Castellion's pseudonym so famous that Bellianism and Bellianist became common terms in the religious discussions of that age, and continued to be such for years afterwards.

Apropos of this pamphlet, Professor Rambaud says : "It should be noted that Castellion is not a sceptic like Rabelais and Montesquieu, not a politician like the author of the 'Satire Ménippée.' He is as firm in the faith as the early martyrs of the Reformation, as sturdy a theologian as Calvin or Theodore de Bèze. His taking up the principle of toleration was not brought about by feelings of French patriotism, of political wisdom, of humanity, nor even of pure Christian charity. No, it was from a scrupulous study of texts that he was led to accept this doctrine. It was his conviction that toleration was the veritable spirit of Christianity and the Reformation. It was from theology itself that he drew his arguments against the excesses of theologians."

In the "De Hæreticis" no mention is made of the destruction of Servetus, which really called forth the pamphlet ; or at least it contains only very vague allusions to this crime. But this act of momentary abstention was not to be taken to mean that Castellion feared to attack his powerful foe in this vulnerable spot. Scarcely was the ink dry on the other pamphlet when he finished the manuscript of "Contra Libellum Calvini," in which he turns his attention to Calvin himself and his recent reprehensible act. He says : "To-day John Calvin enjoys great power, and I would wish it still greater if he were only animated by more kindly sentiments. But his latest action is a bloody murder, and his latest publication is a direct menace to the lives of many pious men." Then the brave author gives the details of the execution and refutes point by point Calvin's theories. But neither this work, nor the "Annotation sur l'Épître aux Romains," which was written in the same spirit, could be printed. Castellion's former publications had created too great a sensation and had worked too much harm to the Calvinists, to permit him to continue to print *ad libitum*. So the censor was called upon to act, and even in the free city of Bâle he was strong enough

to suppress Castellion. The tractate circulated only in manuscript copies.

Castellion was always on the side of humanity and gentleness, as opposed to the cruelty and barbarism of his age. Torture, as a means of forcing confessions from accused persons, was then countenanced by all the jurists of Europe, and religious innovators might be pardoned, perhaps, if they accepted the practice. But at least one voice was raised against it, and it spoke exactly as did Montesquieu and Voltaire two centuries later. Here, as everywhere, Castellion was to be found opposed to Calvin. Somebody objected : "But many guilty persons will escape if torture is abolished." Castellion answered : "No law calls for the punishment of unknown crimes ; be contented to punish those that are known."

Calvin, as everybody knows, believed in predestination. Castellion took up the other view. Thereupon the former attacked him again and directed Bèze to do the same. "How long will you suffer to dwell in your midst this shameful fellow, this clot of mud, this pest?" wrote Bèze to the magistrates of Bâle. Castellion, in his turn, called upon the magistrates of Geneva, but mark the difference of tone and purpose. He said to these recreants, while he urged them to become men and put an end to this intolerance : "For the love of Christ, I beg of you, I conjure you, to leave me in peace and to cease persecuting me. Grant me the freedom of my faith and the freedom to profess it, just as I do in respect to you and yours. If there are those who separate themselves from you, do not declare forthwith that they turn their backs on the truth, do not fall upon them as though they were blasphemers. Taking religion as a whole, I am not in disaccord with you. It is the same Christian religion which I, like you, delight to serve. On certain points of interpretation only, I, with several others, hold different views from you. Let the most learned, then, be also the most charitable!" These words sound as if they were written to-day, instead of over three centuries ago. One might think them to have fallen from the pen of the Rev. Mr. Briggs ! This shows how far in advance of his time was Sébastien Castellion, or rather how far behind the times is modern Protestantism.

Castellion was not simply a musty theologian ; he looked upon religion with the mind of a practical statesman. At the time when the civil and religious wars were raging in France, he wrote, in 1562 : "Keep up the two forms of religion—the Roman Catholic and the Protestant ; let both be free, so that everybody may choose, without constraint, the one he prefers." This was the view Henry IV. took of the matter in 1598, when he promulgated the edict of Nantes ; and this is the view liberal France has been striving to maintain ever since, even down to the present year of grace.

"With Castellion on the one hand," says Professor Rambaud, "and Calvin, backed by Theodore de Bèze, on the other, the conditions of this theological duel were not equal. The latter were supported by the State, by the public authorities, by the courts, and by the public executioner. They had with them the presses ; and, more than this, by the aid of the Geneva censor and the information which was furnished them through the censorships in the other Helvetic states, they could prevent the publication and circulation of the replies and attacks of their opponents. Several of Castellion's most powerful tractates never saw the light in book-form. He was not even secure from bodily harm even at Bâle. In 1563 an attempt was made to get him implicated in a trial brought against a family of Anabaptists which ended with the disinterring and the burning of the bones of one David Joris. At Bâle at least, the *autos-da-fé* were made only with dead bodies."

Insulted by men who were once his friends and teachers, railed at by the multitude, continually in danger of finding himself and family deprived of their daily bread, his very life threatened, Castellion, worn out by bodily deprivation, mental strain, and moral disappointment, died in 1563 at the early age of 48, just as he was on the point of losing his university chair and of being banished from Helvetia. His enemies eagerly took upon themselves to preach his funeral oration. Theodore de Bèze recalled how he had prophesied to him that "the Saviour would soon punish him for his blasphemies." Bullinger wrote : "Castellion is dead. Good !" Gwalter remarked that in order not to have to plead his cause before the Bâle Senate, Castellion had "appealed to Rhadamanthus."

For a century and a half after his death Castellion's writings were known to the learned and the theologians. His books and manuscripts were read by the pious. In the sixteenth and seventeenth centuries two of the greatest Protestant sects—the Socianists and the Arminians—claimed him as one of theirs. The liberal wing of French Protestantism is a son of his doctrine, while here in the United States many of our churches may look upon him as one of their founders. In M. Buisson's final chapter entitled "Posthumous Influences," attention is called to the close union between Castellion's doctrines and those held by Roger Williams and Anne Hutchinson. Of him then it may be truly said that though the body be dead the spirit still liveth.

M. Buisson's first volume contains a portrait of Castellion drawn by the distinguished French artist Jean Paul Laurens after the portrait engraved for Castellion's Latin Bible, edition of 1729. This is the only portrait of him known to exist. "To this cold and dry engraving," says M. Buisson, "M. Jean Paul Laurens has been able to give life without detracting from its austerity." We are further told that the artist undertook the work out of "sympathy, awakened after reading several chapters, for the humble hero of this book."

THEODORE STANTON.

THE GERMAN UNIVERSITIES AT THE WORLD'S FAIR.

HOW much has been said and sung of the academic liberty of German universities! Academic liberty means freedom of research. It implies the independence both of professors and students. The professor is not controlled in his work ; he is not commanded what to do or to teach; he is thoroughly independent and, he cannot be removed from his place. He investigates as he pleases and he lectures to his auditors as he sees fit. Nor does the professor in turn exercise any control over his students. They study if they choose to do so, and, if they prefer it, they may neglect their studies. And the students do not hesitate to make use of their liberty. Many talented youths who do not possess sufficient self-discipline go to the wall, under this system. This is a pity, but so long as the principle of academic liberty prevails, it cannot be helped, and, for that reason, no one in Germany proposes a change in the principles according to which the universities are administered.

Academic liberty has left an indelible imprint upon the German university ; it has shaped its life, institutions, and by-laws ; yet the most important result it has produced is what may be called "the scientific spirit of the German university. While the French and English universities are advanced schools, whose business it is to educate or to teach, the German university is above all other things a temple of science. The appointment and advancement of a German professor does not depend upon his ability to teach but almost exclusively upon his accomplishments as an investigator. Had Darwin lived in Germany he would most likely have been found among

the university professors, for Germany's greatest thinkers, with few exceptions, have lived and completed their lives in academic circles. The German professor is first an investigator and then a teacher. German universities are institutions devoted to the search for truth, and the scientist, the philosopher, the searchers for truth serve at the same time as instructors of the German youth.

The German university consolidates scientific research in a great coöperative body of scholars. Thus it is adapted to give specialised instruction in all the various branches of science and yet it keeps every student in close communion with all other studies, so that the unity of knowledge is not lost from sight. In this way a scientific atmosphere is created which makes the labors of every one that breathes it more efficient. An isolated thinker, even if he had all the books and instruments of his specialty and of collateral sciences as convenient as he finds them at the university, cannot accomplish as much as the man who receives, almost without his being conscious of it, innumerable suggestions and helps from his colleagues in other branches, and is, as it were, carried on the wings of their common aspirations.

The German university system has often been criticised, but criticism has only given it strength and shown its great advantages. The question has been raised, Would not teachers be better as educators than savants? Many professors are incompetent as instructors and even as lecturers! Nevertheless, the direct contact of the students with the great representatives of scientific inquiry outweighs all disadvantages. The German youth receives the most powerful stimuli and invaluable suggestions from his personal intercourse with the thinkers of his time.

All the members of the German universities jealously guard their academic liberty and look upon it as one of the most sacred heirlooms of the German nation. And rightly so, for it creates boldness of research, it promotes progress, and has in times of need proved the last redoubt even of political freedom.

Academic liberty makes the German university of kin to the constitution of our country. No wonder that between the German university and the United States a deep sympathy obtains. We

Americans at least have, on our part, always regarded the German university system as the best realisation of the noblest ideal of all higher education. We have not tried slavishly to copy it, but we imitate it, and attempt to adapt its methods to our special wants. There are no doubt features that cannot be recommended, but certainly the spirit that animates the German university must and will find and to some extent has already found a home on this side of the Atlantic, in the country of political liberty and humanitarian aspirations.

* * *

Considering the importance of the German universities to our country, we joyfully greet their well-planned and excellently arranged exhibit at the World's Fair in Chicago, and here offer to our readers a brief review of this unique display of the ways, the means, and the summarised results of German science.

Where that grand bronze statue* of Germania on horseback, accompanied on her right hand by Strength, on her left by Renown, towers above the German exhibit in the Liberal Arts and Manufactures Building, a double stair-case leads the visitor directly to the heart of the place allotted to the German universities. Here we stand upon their court of honor. We find no exhibit in the proper sense of the word. There are, however, some portraits and statues chastely ornamented with a few gilt acorn, myrtle, and laurel wreaths. Alexander von Humboldt's portrait in large proportions stands prominently before us. Very attractive are the oil pictures of Von Ranke, the historian, Wilhelm Weber, Kekulé, and A. v. Hofmann, the chemist. There is a bronze statue of Kant in full figure and a number of busts, among which we note in the centre the young Emperor; around him and along the aisle, Helmholtz, Kirchhoff, Luther, Schleiermacher, Leibnitz, Liebig, Gauss, and others.

A glass case contains autographs of the very greatest Germans. There are two documents, the one signed by a flourish of Charlemagne, the other sealed by Otto the Great with his own hand; letters of Luther, Frederick the Great, William the First, Goethe,

* The statue is destined to adorn the Reichstag building in Berlin.

Schiller, Kant, Lessing, Grimm, Schleiermacher, and Winckelmann.* Plans, elevations, and photographs of the various university buildings in big folios bound in leather are exhibited on desks. Near by are the libraries, showing their methods of shelving and cataloguing books;† to the left we have the physical and mathematical, to the right the bacteriological and physiological sections.

There are several monumental works of German patience and industry, such as Grimm's "Wörterbuch" and the various "Corpora Inscriptionum." We find among them Wenker's "Sprachatlas," a new enterprise which shows in a simple and systematic manner the linguistic boundaries of Europe. Three hundred characteristic words have been selected and their pronunciation in the various villages carefully noted down by the schoolmasters, according to the directions of a circular letter. The result is easily surveyed in the maps. The work is as yet incomplete, and it is estimated that it will comprise about nine hundred folio charts.

The mathematical section surprises us with its wealth of mathematical models. French mathematicians in the Fifties, still under the influence of Monge, were the first to understand the great value of embodying in visible form their abstract space-constructions. Not he who computes with arithmetical methods but he who has an intuitive conception of spatial relations is the true mathematician, and how can the latter quality be better developed than by models that show at a glance all the complexities which it is sometimes so difficult to realise by abstract imagination. German mathematicians have learned from the French, and it appears that they now excel their masters. It is astonishing how much has been accomplished in this branch of education in the last twenty years.

There are several cases of Brill's models, many of which owe their origin to the exercises which were held at Munich by Pro-

* It is not our purpose to enter into details, but we may mention incidentally that some of the letters admirably characterise the men and the nation to which they belong, in their noblest sentiments; especially the letter of Frederick the Great; while others, for instance Kant's letter, thanking a friend for a gift of Teltauer turnips, are of a trivial nature.

† For the details of German Library institutions consult Dr. Dziatzko's *Denkschrift*, and P. Schwenke's *Addressbuch*, both on exhibit.

fessors Brill and Klein in 1877-1885, showing surfaces of the second, third, and fourth degrees, "Kummer"-surfaces, cyclides; surfaces of constant curvature, geodetic lines, asymptotic curves to surfaces, and other mathematical forms. The thread models (made by Wiener of Karlsruhe and Karl Rohn of Dresden) present a beautiful appearance and are especially calculated to excite the curiosity of the uninitiated. Professor Schwarz of Berlin shows us a few Riemann-surfaces in bodily realisation. Dr. Sievert (teacher at the Gymnasium at Nürnberg) materialises surfaces of positive curvature. The wire models of Dr. Victor Schlegel (of the Gymnasium at Hagen) represent projections of four-dimensional bodies in three-dimensional space. There are also crystal models and graphical diagrams of various descriptions.

The practical importance of a vivid mathematical imagination, to educate which these models are excellently adapted, lies mainly in the fields of mechanics and physics.

The energies of the mathematician, formerly so much occupied by computations, are now more employed in the properly mathematical fields, while comptometers will alleviate his work by calculating his examples with less trouble and with unfailing mechanical accuracy.

We find the Meyer addition machine, and a number of comptometers, among them Grimme's, the Russo-German *Brunswiga*, and a very interesting instrument called the *Selling Rechenmaschine*. The latter is built on the principle of the lazy tongs, or, as the Germans call it, the "Nürnberg shears." It is known that if the axis in the first link be moved one unit, the second will move two, the third three, the fourth four, and so on. The Selling machine contains ten seven-linked lazy tongs with wheels for the decimal transfer and can execute in a purely mechanical way multiplications and divisions of any number of nine figures with any number of seven figures. The result appears typewritten on paper up to thirteen places, which for common use will be sufficient. A few numbers of frequent occurrence, such as π , can be called up by pressing a certain button.

The machine will have a great fascination for Americans. Its principle is simple enough, but its application is still very complex, so that its practicability must remain doubtful. At least, it seems

to us, that such American machines as the Felt comptometer are better for practical purposes.*

The physical section contains many historical curiosities, such as Guericke's air-pump and the Magdeburg hemispheres, part of the wire of the very first telegraph, invented by Gauss and for practical purposes improved by Morse, and, in addition, many original instruments of Weber, Gauss, Kirchhoff, and Helmholtz.

At the time when Gauss made his telegraphic experiments he wrote under his picture these English words :

"Thou, Nature, art my goddess!
To thy laws my services are bound."

The psychological department contains instruments invented and used by Helmholtz, C. Stumpf (Munich), W. Wundt (Leipsic), Goldscheider (Berlin), Ewald Hering (Prague), and Ebbinghaus (Berlin).

At the other end of the University exhibition we find the anatomical section. There are microtomes of different make, and several good preparations. The anatomical models are good, but do not reach the neatness and accuracy of detail which we admire in Dr. Auzoux's "clastic anatomy" at Paris.

Professor Flechsig's hand-made diagram of the nervous paths in the nervous system deserves particular attention, embodying, as it does, the very latest results, most of which were made by Flechsig himself. It is to be hoped that this chart, with its manuscript explanations covering no more than twenty or thirty manuscript pages, will soon be published, so that it may be accessible to all interested in the anatomy of the brain.

One staircase higher leads us to the Botany exhibit, which appears in the shape of large-sized flower models; to the Zoölogy exhibit, showing hand-made wall pictures of apes, while Dermatology wisely covers the most important part of its demonstrations.

* The Brunswiga works by a crank; it adds and subtracts, multiplies and divides. In the Felt comptometer the keys perform the work automatically; in addition, this machine finds the square and cube roots of numbers. It seems to be much used in business. Cornell University, I am informed, employs three Felt comptometers in its various departments, while a fourth one serves for purely educational purposes.

We must resist the temptation to describe at length the exhibits of other sciences, such as astronomy, with its various branches, chemistry, mineralogy, hygiene, surgery, ophthalmology, and others, and will merely state that the bacteriological department exercises a great attraction for physicians and laymen. There are the vials, tubes, and hatching-stoves of Koch and his colleagues ; there are the nests and colonies of the various pure cultures in bodily presence ; there are the photographs of these criminals a thousand times magnified ; and the white powder exhibited in tubes and displayed in one of the cases contains the very poisons with which they bring about their nefarious results. A small case in the corner of the room shows us the antidotes, which, according to experiments made on animals, will neutralise the effects of the tetanus and some other bacilli.

* * *

In addition to these exhibits, the German universities have given to the world a two-volume digest of large octavo size which in a few more than a thousand pages briefly reviews the work accomplished in the various branches of science. "These accounts," so we read in the preface, "are not intended to recapitulate the progress of science generally, but only to indicate how far the German universities have contributed to it. That, accordingly, the merits and accomplishments of foreign science were excluded from detailed recognition and appreciation must of course not be interpreted as the result of a desire to make the work of the German universities unduly prominent. On the contrary, the German universities will remain fully conscious of how much they owe in their scientific aspirations to the labors of other nations."

The editor of the work is Prof. W. Lexis, the prominent Economist of Göttingen. The first volume begins with an essay on the German university by F. Paulsen of Berlin ; it is a fascinating description of its history and present conditions (pp. 1-111) supplemented with statistical tables by J. Conrad, of Halle (pp. 111-168). The special sciences are arranged according to the faculties and are reviewed as follows :

Theology is divided into two parts. The Evangelical faith is

represented by E. Haupt, E. Kautzsch, F. Loofs, M. Kähler, and H. Hering, while the Catholic doctrine is treated by G. Hoberg, J. Felten, B. Fechtrup, P. Schanz, F. X. Heiner, and H. Keller.

Professor Haupt says (p. 180) :

"The theological faculties, though in point of form completely free, are yet a real coadjutor of the practical work of the Evangelical Church. If conflicts arise—and in our day they frequently do arise—between their work and that of practical ecclesiastical circles; if it is complained that intellectual critique now almost exclusively occupies the time of students and that the young people are unfitted for service to the congregations of the church: the academical theologians will certainly not deny that many imperfections still adhere to their work. But they are convinced that any one-sidedness that is thus produced will be overcome by the further scientific and religious education of the students and especially by their work in pastoral fields. In fine, we must have patience, and must look for reconciliation between faith and science, in the individual as well as in the whole church, from a steady coöperation of these two factors, and see that such a reconciliation can only be slowly and gradually effected. Theological science is an integral part of the totality of science, an integral aspect of church-life generally, and finally, a means of creating in the holders of practical church-offices independence of judgment and sureness of action."

The position of Roman Catholic theology is greatly simplified. Professor Hoberg regards Franz Kaulen's treatment of exegesis as epoch-making. "Kaulen," he says, "defines biblical isagogics as a justification of the ecclesiastical doctrine anten inspiration and the canonical character of the Scriptures, therefore, subsuming it under apologetics." "Thus," he adds, "it acquires a strictly scientific character, so that this form of treatment will forever serve the Catholic Isagogist as a model."

The problem which perplexes Evangelical theology does not exist to Hoberg. As if intending a reply to the above-quoted passage of his evangelical colleague, he says (p. 240) :

"If the works of Catholic exegetists in the Old Testament field fall short in number of those of non-Catholic scholars, this fact is chiefly due to the circumstance that biblical research in the Catholic sense rejects as a matter of principle many theories of non-Catholic research, and, consequently, has no reason to treat these theories scientifically."

It is encouraging to see that Professor Haupt does not despair of a final satisfactory solution of the theological problem.

Prof. O. Fischer, of Breslau, has written as an introduction to the section of jurisprudence an essay on the general study of law. Ernst Eck, of Berlin, treats of Roman law, which, we ought to add, is unduly neglected in England as well as in America. The other juridical branches are represented by H. Brunner, of Berlin; E. Strohal, of Göttingen; K. Kossack, of Freiburg i. B.; O. Fischer, of Breslau; F. E. von Liszt, of Halle; G. Meyer, of Heidelberg; F. von Martitz, of Tübingen; L. von Bar, of Göttingen; R. Sohm, of Leipsic; J. Kohler, of Berlin; and A. Merkel, of Strassburg. The statistical appendix is by Guttstadt, of Berlin.

The philosophical faculty, which in almost all German universities comprises everything that does not belong to the three others, is divided into two groups, the humaniora, and mathematics and the natural sciences. J. Baumann of Göttingen offers an admirably condensed synopsis of the evolution of German philosophy since Leibnitz. Wundt describes the psychophysical institutes and their work. Philology, including history and archæology, is represented by N. v. Wilamowitz-Möllendorff (Classics), K. Weinhold (German), A. Brandl (English), A. Tobler (Romance), E. Sachau (Oriental), F. Kielhorn (Sanskrit), K. Brugmann (Comparative), H. Zimmer (Celtic). Modern History is treated by Th. Lindner, History of Art by Hermann Grimm, and Political Science by H. Dietzel (economy and finance), E. Gothein (the evolution of the science of economy), and W. Lexis (statistics).

Mathematics and Natural Science constitute a faculty of their own only in Tübingen, Strassburg, and Heidelberg. Professor Lexis, the editor of the present work, found it convenient to treat them in a special section which appears as the first part of the second volume.

Prof. F. Klein sketches the tendencies of mathematical investigation during the last two centuries. Gauss inherited all the traditions of Leibnitz, Bernoulli, Euler, Lambert, Lagrange, D'Alembert, and Maupertuis. Unsurpassed in exactness of proof, he introduced new views and new methods and he again imparted his spirit to a number of disciples whose mission it is to develop in harmonious coöperation the various branches of mathematics. In addition to him we find such men as Jacobi, Clebsch, and Dirichlet. Jacobi's

maturest work is his theory of elliptical functions ; Clebsch received the most fruitful suggestions for his algebraic conceptions from the English mathematicians Cayley and Sylvester. Of Dirichlet, whose labors were closely allied with French thought, may be mentioned his theory of numbers and his mathematical physics. Grassmann stood outside the academical circles, which was the cause of his tardy recognition. Steiner, a more isolated thinker, was powerful through his original one-sidedness. Riemann proceeds from Gauss and Dirichlet, whose conceptions he combined with Cauchy's ideas of the application of complex variables ; Clebsch forms a contrast ; he is complementary, as it were, to Riemann ; and his tireless energy was not satisfied with his academic work. He founded with C. Neumann the *Mathematische Annalen*, a magazine which still exists and has now reached its forty-second volume.

In addition to the Göttingen School we have the Berlin School represented by Kummer, Kronecker, Weierstrass, and also the Polytechnica which are the main home of those mathematicians who, according to the French ideal, apply mathematics to technical industry. Representative of this latter class are Redtenbacher of Carlsruhe and Culmann of Zürich.

We pass over the accounts of (II) Astronomy by H. Seeliger, (III) Physics by A. Kundt, (IV) Chemistry and Chemical Technology by O. Wallach, (V) Physical Chemistry by W. Ostwald, (VI) Mineralogy and Crystallography by Liebisch, (VII) Geology and Palæontology by K. v. Zittel, (VIII) Botany by E. Strasburger, (IX) Zoölogy and Comparative Anatomy by R. Hertwig, (X) Anthropology by J. Ranke and Ethnology by E. Grosse, (XI) Geography by H. Wagner, (XII) Meteorology by W. v. Bezold, (XIII) Farming by J. Kühn, (XIV) and Forestry by Professor Lehr,—all of which contain much interesting detail. We quote one passage in full because we trust that the subject commands a general interest. Professor Hertwig concludes his article as follows (pp. 109-111) :

"We should acquire a very imperfect notion of the course of development which zoölogy has taken in this century in German universities, if we were not to take into account the tremendous influence which the Darwinian theory has exercised. In no country did this theory find such quick acceptance, in no country has

it so completely dominated scientific life, as in Germany. It may be said that to-day all teachers of zoölogy and comparative anatomy are more or less pronounced adherents of the idea of evolution. Among the men to whom this rapid introduction of Darwinism in Germany is to be attributed, is to be mentioned, above all, Ernst Haeckel, who in many treatises and especially in his *General Morphology*, which has deepened the spiritual contents of zoölogy in many directions, has done more for the methodical development of the theory than any other inquirer. Next to Haeckel, O. Schmidt, Weismann, and M. Wagner (of München) have taken a prominent part in the controversies of this question.

" If we go more minutely into the manner in which Darwin has acted on German zoölogy, two elements of Darwinism must be sharply distinguished : (1) the theory of descent, which it has in common with earlier theories of evolution ; and (2) the causal establishment of descent by means of the struggle for existence, by which it is distinguished from the other theories. The doctrine of the struggle for life has met with quite unequal assent in Germany. One energetic champion of the theory has arisen in Weismann, who explains the transformation of species wholly by this method, rejecting other causes, such as the influence of environment and the use and non-use of organs which Lamarck emphasises, for the reason that acquired characters are not hereditary. On the other hand, there have been no lack of voices which have disclaimed for the struggle for existence all influence whatever in the development of species. M. Wagner especially has opposed the Darwinian theory, enunciating and defending with great acuteness the doctrine of migration, by which new species can have arisen only through geographical isolation.

" It may be said generally, that the disputes indicated have not been pursued with the same ardor by German zoölogists as they have, for instance, in England. For German zoölogy, Darwinism in its narrower sense stood less in the foreground than the theory of evolution which received new life through him. Besides, evolution has assumed a distinct stamp in Germany, and one which is deeply grounded in the character of German zoölogy.

" The train of thought which led Darwin to the enunciation of his theory was preëminently the train of thought of the systematician, who sought to acquire a clear conception of the value of the notions species and variety. In Germany, however, it is the morphological side of the theory of descent that is especially cultivated. It is here sought, by comparative anatomical and developmental studies, to establish the natural relationship of living animals, in order to clear up in this way and to demonstrate the historical development of the animal kingdom—its "phylogeny" as Haeckel calls it. The endeavour is made to derive the more complicated organs of higher animals from the simpler states of embryos and lower organisms, with a view of obtaining an insight into the laws of formation of organs and of revealing the connexion between the facts of anatomy and developmental history—a connexion for which Haeckel gave the explanatory formula in his biogenetic law. By these tendencies comparative anatomical and developmental research necessarily received

fresh impulses, and the zoölogy of Germany thus affords us the interesting spectacle of the successful coöperation of two great intellectual movements. The development of the theory of descent in German universities was prefigured by the morphological tendency of German research, and in its turn this theory also exercised a determinative and fruitful influence on morphology. Morphology and the theory of descent are thus the two factors that now dominate the zoölogical research of the German universities and that probably will dominate it for some time to come."

The report of the medical faculty opens with a careful survey of the present state of anatomy (pp. 187-233) by W. Waldeyer of Berlin. Physiology is sketched by L. Hermann, the editor of the six-volume *Handbuch*. The constantly increasing import of pathological anatomy is forcibly set forth by R. Virchow (pp. 241-261) who believes that pathological chemistry will in the future become more and more indispensable. The revolution that took place in the treatment of internal diseases through and since Virchow is reported by H. v. Ziemssen. The progress made in surgery is reviewed by J. Mikulicz. Since Lister's innovation, surgical operators became bolder than ever; German surgeons have slowly changed the antiseptic method into a purely aseptic one. Names such as Bruns, Billroth, Volkmann, Langenbeck, Bergmann, and others are famous, and their successful operations have astonished the world. Gynaecology is summarised by H. Fritsch, the Treatment of Children's Diseases by A. Baginsky, Ophthalmology by A. v. Hippel, Psychiatry by Ludwig Meyer, Dermatology by A. Neisser, Diseases of the Throat and Nose by B. Fränkel, Otology by H. Walb, Dentistry by F. Busch, Pharmacology by C. Binz, Hygiene, which since Pettenkofer has become an independent and indeed an important branch of medicine, by C. Flügge, and Forensic Medicine by Skrzeczkka.

It would be unfair to expect the report of the German universities to be complete; it is at best a fairly approximate summary which is to some extent influenced by the preferences of the various contributors. It is but natural that Göttingen and Berlin are noticeably prominent, Berlin as the capital of Modern Germany and Göttingen as the university at which Anglo-American traditions are still prevalent. To criticise omissions, where, according to the

reviewer's taste, more should have been said, would be unfair. Some subjects have been neglected, modern logic, for instance, has been entirely dropped. But we must bear in mind, first, that it would be all but impossible to satisfy all *desiderata*, secondly, that the whole work had to be completed in three months, and, thirdly, that it is a courteous gift which does honor not only to the giver, that magnificent body of German savants who constitute the German universities, but also to the American nation whose respect and good opinion our brethren beyond the Atlantic solicit in such a kind and amiable way.

* * *

America is often ridiculed as the land of the almighty dollar. Germans especially are disposed to believe that our people are materialistic and devoid of all ideals. This is a misconception. America is perhaps the most idealistic country in the world. Americans, it is true, are practical, and mean to be that, but they are not materialistic. We can unhesitatingly say, that should a million dollars, or several millions, be wanted in any one of our great cities, New York or Chicago or San Francisco, for some enterprise of urgent communal interest, be it a hospital, a school, a life-saving station, or what not, the money would be pledged within a day, if but the men who undertook the work were a guarantee that the plans would be properly executed and the institution serve its purpose. If we measure the idealism of a country in foot-pounds of energy that people expend in its service, if we measure it by the sacrifices voluntarily made for ideals, there can be no doubt that America ranks first among all the nations of the world.

The World's Fair at Chicago is indeed characteristic of the spirit that animates American character. There has never before been an exhibition in which the purely commercial interests were so much overshadowed by the higher and nobler purposes of national education. The managers of the World's Fair have made everything subservient to the one thing needed, that is to raise the civilisation of the people and to improve their minds by instructing and by entertaining them. The World's Fair imparts information, it educates, and it teaches a great object-lesson. The administration is

certainly not without faults, yet upon the whole it has been conducted, according to the intention of the shareholders, so as to ensure an ideal rather than a financial success. Gain or loss was regarded as a matter of subordinate consideration.

The exhibit of the German universities accords most harmoniously with the general plan of the World's Fair at Chicago. It is very welcome and we are grateful to the men to whose labors we owe the instructive and successful execution of such a valuable work.

We do not wish to glorify our country in any vain spirit, for we are by no means blind to its many imperfections. We know that there are many drawbacks to our political and social conditions, but we are at the same time confident of national improvement. The spirit of a practical idealism will conquer in the end, and those elements which expect to prosper by corruption will perish.

We believe in liberty; we enjoy its benefits and accept the consequences of an ill-employed liberty, also. Our people have themselves to blame if they suffer from the vices and errors of their magistrates and legislators. They must learn by experience. Many of our political institutions, especially our civil service, need reform. As they are at present, we observe that rectitude and a faithful attention to duty are not always rewarded, while dishonesty is often actually at a premium.

Considering the vicious system of our civil service, we must be lenient in judging the corruption that prevails in many of its branches. We should rather say it is, after all, marvellous that conditions are not worse. It is comparatively easy for the employees of the German Government to be and to remain honest, for so long as they attend to their duty, they are safe in their positions, and no emperor or governor or superintendent can remove them. A change of policy in the government only implies a change of the chiefs of the various departments. Would European officers maintain their well-deserved reputation for honesty and efficiency, if they were suddenly transplanted into such conditions as prevail under our faulty system?

The evils that appear in our national and social life are bad enough; they lie on the surface and obtrude at once on every one

who visits our country. But they are not irredeemable ; they are set off by great and solid virtues. He only who feels in his own heart the pulse of the most sacred aspirations and hopes of this nation, can appreciate the grandeur of its rare possibilities.

Moreover, the evils that accrue from a wrongly applied liberty are educational ; they will impel us to advance on the road of progress. They will force us to raise the general standard of civilisation. They impose a great duty upon us, which, we grant, is very difficult to perform ; but the performance of this duty will create a nobler and higher type of humanity. Those who have no faith in ideals and the power of ideals, who have no confidence in progress and the higher possibilities of mankind, naturally regard the task as impracticable. While we are fully aware of all the difficulties, we yet do not despair of the situation. There is a divinity in the world that aspires to incarnation ; and this divinity is still alive in mankind. Through errors and true knowledge, through adversities and prosperity, through misery and happiness, through good and evil times, through despair and hope, through sin and saintliness, folly and wisdom, the God in man struggles onward. The mass of mankind may be ever so wretched, the ideal will sprout and develop like a mustard-seed, and its growth will astonish the faint-hearted.

We shall have to pass through many sad experiences, but it is certain that in the bracing air of freedom the fittest will survive, and fitness is inseparably bound up with morality.

Freedom, be it academical or political, is not favorable to the weak ; it proves destructive to those who lack independence or self-control ; the unfit must fail. Yet the results are not to be deplored.

Recognising the kinship between the German university system and the institutions of our own country, we say, the greatness and the glory of German science are due above all to its academic liberty, and the promising future of our national hope depends mainly upon the right use we shall make of our ideal of freedom.

EDITOR.

LITERARY CORRESPONDENCE.

FRANCE.

THE recent work of M. J. Novicow, *Les luttes entre sociétés humaines et leurs phases successives*, forms an interesting contribution to social science. The author, by birth a Russian, has already published a book in our language, *La politique internationale*, which has been the subject of much comment. Works of this kind, once said a distinguished German to me, labor under the misfortune that they are not read by statesmen, and that the scholars and students who read them are unable to apply their teachings. This objection does not absolutely hold, for the general thought of mankind, which in the end always impresses itself on governments, is continuously modified by the secret infiltrations of books, and, as M. Novicow himself writes, "it is only by acting on public opinion that we can hope ever to control the world."

This large work—it contains not less than seven hundred and fifty pages—would have gained much by being abridged and more thoroughly systematised. Filled with indifferent facts, a severe revision would greatly increase its worth. But I do not wish to cavil: more important criticisms claim our attention.

In reviewing the general arguments by which M. Novicow connects his conception of human society with the leading ideas of biology and astronomy, we discover at once that, with all the sociologists of our time, he has absorbed the powerful influence of Comte. But he has also acquired from the English school the faculty of painstaking care and the laborious consideration of details. "It is owing to the neglect," he writes, "which has prevailed till the pres-

ent time, of a careful examination of almost imperceptible facts that sociology is still so far behind the other sciences." For the foundations of his work, he directly borrows from Darwinism the principles, now so widely diffused, which the simple phrases "struggle for life," "survival of the fittest," "adaptation," etc., will suffice to evoke in all minds. He is not, indeed, the first to apply the ideas of evolution and competition to social phenomena. But his work is precisely executed ; and if the conclusions which he presents do not all clearly and indubitably proceed from his biological premises, it must yet be acknowledged that he reaches results to which these premises give greater solidity and which have, thus, infinitely more chance of being exact. Sociology, in the present state of affairs, cannot give us more.

The fundamental thesis of M. Novicow is accordingly this : that the struggle between the component groups of human society is a prolongation of the great struggle for life which rules the whole animate world ; that it is continued here in many different forms peculiar to social phenomena, and that all our efforts should be to bring it about that this struggle produces progress and justice, that is to say, "an acceleration of adaptation." And to establish the equivalence of these factors, the biological and the moral, so often supposed contradictory, is the task on which M. Novicow concentrates all his powers.

According to him, the biological law is constantly transforming itself into moral law ; a contention which he proves by a contrast of the struggle for life as it was in the past with what it has become in the present and probably will become in the future. In proportion as the social aggregations of humanity have become more and more perfected, the competition of life has taken higher forms : the purely physiological, or animal, struggle has been followed by economical and political struggles, and finally, by intellectual struggles, and in each of these successions of facts we have beheld processes more rational and rapid take the place of the old faulty and tedious ones. I must refer the reader to the book itself for the full development of all these points, and restrict myself here to pointing out in a few lines the general solutions of the author : in the economical

order are opposed, the vices of protectionism, which is at bottom nothing else than "the spoliation of the capable at the expense of the incapable," and the salutary practice of free trade; in the political order the free association of social groups takes the place of the illusion of great states, the state of peace succeeding the state of war, which can be nothing more than a simple pathological accident; in the intellectual order, religious persecution, constraint under all its forms gives way to spiritual activity, to the free communication of minds through space; in fine, the suppression of the idle and factotum state, and of the frightful fiscal tendencies which are its expression; the liberty for every individual of living where he thinks best, and also for each group of associating itself with the nationality which it may select; the voluntary federation of states instead of the so-called equilibrium of powers; "an intense upward movement, the ardent struggle and victory of the better, realised with the greatest possible rapidity."

Some will reproach M. Novicow with having set up here a theory of individualism—even to the extent of establishing an individualism of collective groups—at the very moment when this doctrine has produced its last excesses. To which our author might reply that these excesses are such only in appearance, and that it is now time to stop in the movement of reaction which is carrying us headlong into the abyss of state-socialism, the most ruinous of tyrannies. Others will accuse him of attempting to build in the air an imaginary republic. But he knows the difficulties with which he has to deal, he does not reckon without the factor of time, and it is the briefness alone in which I have here expressed his doctrines that makes them appear so extreme.

No, M. Novicow does not dream of an idyllic society. He is bold without being adventurous, and free from prejudices without being revolutionary. It is primarily in the interests of real gain, understood in its best sense, that he protests against the erroneous doctrines of the old society, and it indeed seems at times as if he were "beating down open doors." But it often happens that open doors close behind us, and, besides, we have within us, almost without exception, a double nature, that of our scientific instruction and

that of our prejudices. Our conduct is a perpetual compromise between the men which we were yesterday and that which we shall be to-morrow. In the eyes of the child there is no reason that the design of society should change any more than should the profile of the mountains on the horizon. The majority of men preserve this infantine illusion and cry ever for an Utopia. Meanwhile, the world changes without cessation, and in the end *all* is accomplished—even that which is reasonable.

* * *

M. F. R. PAULHAN'S new book, *Joseph de Maistre et sa philosophie*, carries us a good ways from M. Novicow, far behind him, and also far in advance of him. To Joseph de Maistre, and in the point of view from which he is usually regarded, the future is only the mirage of the Catholic past, or that past the rough outline of the future. It is this idea which M. Paulhan has so well placed in relief. The personality of Joseph de Maistre, so interesting to French thought, should not be less so to American thought. Certainly every reader will derive benefit from the book of which I am now speaking, a brief, excellent and precise study, the best which we yet possess on this rare writer and original thinker.

Here we may see what secret bonds unite the most dissimilar minds; how much, different philosophies modify the same facts; and how greatly, also, the force of facts can reduce the divergencies of different philosophies! I extract from a page of De Maistre these passages: "In the vast domain of animate nature open violence reigns, a species of foreordained anger that arms all creatures *in mutua funera*: the moment you pass from the kingdom of insensible matter you find the decree of violent death written on the very boundaries of life . . . a philosopher can even discover how this eternal carnage is foreseen and ordered in the great All. . . . The entire earth, constantly saturated with blood, is but an immense altar, on which all that lives is immolated, endlessly, immeasurably, without relaxation, till the consummation of things, till the extinction of evil, till the death of death." Here is the law of the struggle for existence, formulated with sombre energy a half a century before Darwin. But it does not assume in the doctrine of Maistre its

"natural" purport. For him, pain and war are the *expiation* of the evil of the world. Men are one with each other; each is satisfied through the other. War, moreover, involves an advancement towards what has always been our dream, *unity*. It is of no consequence here that Joseph de Maistre wished to realise temporal unity by means of a "king," and spiritual unity by the Pope. His conception of unity and his view of the enigma of pain make him turn his eyes to the future. For this Catholic and Christian thinker, religion does not possess its supreme value so much in virtue of its dogmas as in virtue of the unity of beliefs and habits that it realises, i. e. by the quantity of common feeling which it creates. War, if an expiation, is the indicator of our progress towards that unity, that "accord," the ultimate sign of which will be the disappearance of evil. "Evil," writes Maistre, "is the schism of life, it is untruth."

If we put these things in other words, and picture to ourselves other political processes and other details of operation, we shall not be so far from Maistre as we think. M. Paulhan is right. "If we will but transpose, so to speak, the thought of Joseph de Maistre, and interpret it in a slightly different manner from what it has been, we shall not only enjoy the beauty, but shall also apprehend the truth of his ideas, and, to a great extent also, of his general theories."

M. PAUL SOURIAU has recently published a book entitled *La suggestion dans l'art*. There is, in this interesting work, no lack of facts or of subtle expositions. But I have some objections to its thesis—that art is a matter of suggestion. If we simply compare the effect produced on us by a work of art to the effects of hypnotism, the comparison is admissible and offers striking hints. But if we identify aesthetic pleasure with hypnosis, we commit, in my judgment, a singular abuse of language. And if, finally, we advise the student, in order to augment the effect of art, to have recourse to hypnotic methods, the artist will soon have a public formed only of "suggestible" individuals *par excellence*, that is, of hysterical and degenerate subjects. M. Souriau, unfortunately, does not fully adhere to his comparison. He seeks to explain the enjoyment of art

as a species of hypnosis, and he would go perhaps to the extent of accepting a theory of hallucinatory dreams produced by the combined seductions of smell, sight, hearing, and touch. A chaste hallucination, of course, in which the artist would not address the senses, but would acquire a mastery of souls and cause the beautiful dreams of his own mind to pass into those of others!

I oppose theses of this sort always, in whatsoever form they appear.

When we make the charm of art consist of hypnosis, we neglect too much the importance of the specific sensation without which there is no true art. And this is exactly what M. Souriau does, despite his delicate artistic sense. He sets too little value on the pleasure attached to the simple sensorial perception, and he does not perceive that by following that inclination he arrives at an æsthetics of Ruskin, and enrols himself among the Pre-Raphaelites, or in the neuropathic school of art. If the sensation of hearing or of sight plays in music or in painting so slight a part, it will no longer be worth one's while to become a Rembrandt or a Beethoven. A colored scarf that blinds the eyes, a tom-tom that deafens the ears, will fulfil equally well our purpose. If hypnosis is the perfect state of emotion, there is no need of great effort to put us to sleep, nor even to procure for us agreeable dreams. As to the means of putting the hallucinations into our poor little brains, if the artist could ever become the magician that M. Souriau pictures him, he would not be slow, alas, to abuse his power and would soon be banished from all free states.

But things really come to pass in a more simple manner, both in the artist who creates, and in the hearer, the spectator, who admires. M. Souriau knows this well, and he is too good a psychologist to be given a lesson on this point. But he has yielded to the temptation of pushing a seductive analogy to extremes; he has forgotten that "comparison is not reason," that analogy is fraught with dangers, and that one should be careful in the reduction of all phenomena of a class to a single principle, lest we lose track of the whole.

It would be easy for me to add to these criticisms, in con-

nexion with a work of Wundt's which has just been published in French, under the title of *Hypnotisme et suggestion*. Wundt vigorously combats here Schmidkunz's theory, which I also contested in the *Revue philosophique*, that all psychical facts, from simple perception to the noblest artistic and social creations, are nothing but "suggestions." But I shall not insist here on these points, as I have also a few words to say of another attempt, quite different, but equally adventurous, in the field of æsthetics.

* * *

M. MAURICE GRIVEAU, in his *Éléments du beau, analyse et synthèse des faits esthétiques d'après les documents du langage*, has set himself the task of making an inventory of language, with the view of discovering in such an inventory the elements of the beautiful, or, more exactly, the reason and the value of æsthetic judgment in all fields. One of our best-known poets, M. Sully Prudhomme, attempted a similar task; but he did not aim at the same end as Griveau, whose object is none other than to establish a numerical æsthetics, that is to say, to refer our judgments of taste to operations of "unconscious mathematics."

What kind of relation, the reader will ask, can possibly exist between such a mathematics and the adjectives of the languages we speak? Picture to yourself a vast lexicological table where all qualitative words are arranged in two crossed directions, first, in a vertical direction, according to their qualitative value (in the hierarchical order of the sensations, from the most elementary to the most complex), second, in a horizontal direction, according to their quantitative value, (forming a scale indicating the increase of intensity of sensations). This table arranged, he deduces from it—I cannot enter into details—two principal facts. The vertical arrangement of epithets shows us that language always passes from the symbolism of "reflexes" to the expression of "states of consciousness"; for example, from a subjective point of view, *alléchant, rafraîchissant, agréable*; from an objective point of view, *sucré, doux, bon*. The horizontal order reveals a curious fact, that the extreme terms of every lexicological gamut are pejoratives, (thus, *glacial* and *brûlant, fade* and *acré, imperceptible* and *assourdisant*), the interme-

diary terms generally remaining favorable for starting from a middle point, or rather from a mean zone of indifference.

Now, these various zones of a gamut have their exact physiological expression. The table of qualificative words can be translated by a "gradual contrast," passing, through different states, from increasing inhibition to the left to increasing dynamogeny to the right. The mediocre answers to the just mean; at the intermediary points the feeling becomes æsthetic; at the extremes the organic sensation alone dominates, and we reach the limits where impression becomes painful. "Imagination completes its rôle of appreciation when sensibility begins its rôle."

But are not our internal states, thus placed in relief by language, correlated with the exterior rhythm of things? Does there not exist an objective ideal, the positive sum of harmonies and dissonances, to which our different states of physiological ease and disease attach themselves? In fine, can there not be disengaged from some such scheme of human speech a graphic system whose chief lines blend with that of the *oscillation of some correspondent reality?* These are the questions that have led M. Griveau to the theory of numerical æsthetics, and in this domain he has found a coadjutor in M. Charles Henry, whose patient and difficult researches I shall some day discuss.

In the want of other positive results, the inquiry of M. Griveau will furnish at least a confirmation, quite unexpected, of the theory of Spencer and Grant Allen, according to which "an æsthetic feeling is at bottom only a weakened physiological sensation."*

LUCIEN ARRÉAT.

* All these works are published by Alcan.

CRITICISMS.

OBSERVATIONS ON SOME POINTS IN JAMES'S PSYCHOLOGY.

III. WILL.

Although I have already quoted the remarks with which Professor James opens his chapter on this subject, they are of sufficient importance to warrant repetition :

" Desire, wish, will, are states of mind which every one knows, and which no definition can make plainer. We desire to feel, to have, to do, all sorts of things which at the moment are not felt, had, or done. If with the desire there goes a sense that attainment is not possible, we simply *wish*; but if we believe that the end is in our power, we *will* that the desired feeling, having, or doing shall be real; and real it presently becomes, either immediately upon the willing or after certain preliminaries have been fulfilled."

With this statement of the case I am in entire agreement. With two slight qualifications, it seems to me to include all that is essential in volition. I should supplement it by saying that the desire for the thing in question must be stronger than for anything that is perceived to be incompatible with it, and that it must be thought of as attainable by our own exertions. Although we may wish for the sunrise, and believe that our wish can be realised, we do not will it.

Professor James, on the contrary, unless I entirely misapprehend his meaning, devotes the greater part of his chapter of more than a hundred pages to an elaborate attempt to show that this statement is, if not incorrect, at least very incomplete; that the fundamental, essential thing in will is not desire, but attention. Desire, according to his view, is one of the principle things which may fix our attention on an object, and thus excite voluntary action, but it is only one among many causes which may bring about the same result.

It will perhaps tend to simplify the discussion if I state at once that, so far as this point is concerned, the difference between us is, at bottom, one of definition. The question is whether certain acts, taking place under conditions described by him, are properly called voluntary. With his statement of the facts I have little fault to find, but it seems to me that the inferences which he draws are calculated to introduce confusion in regard to matters which are, for practical purposes, clear.

in the minds of plain people. To save space, I must pass over many things with which I agree, and which are admirably put, to come to the essential point of difference. I must, however, call attention to his able, and, to my mind, convincing argument against the existence of what Wundt and his followers call the "feeling of innervation." It seems to me that he shows, beyond reasonable doubt, that, so far as this feeling has any existence, it is due to the sensations arising in the parts concerned in the movement, of which it is thus a result.

The starting-point of the argument is the unquestionable truth that voluntary movements, being intended beforehand, must be movements of which we have previous knowledge from their having been involuntarily performed.

"... if, in voluntary action properly so called, the act must be foreseen, it follows that no creature not endowed with divinatory power can perform an act voluntarily for the first time. Well, we are no more endowed with prophetic vision of what movements lie in our power, than we are endowed with prophetic vision of what sensations we are capable of receiving. As we must wait for the sensations to be given us, so we must wait for the movements to be performed involuntarily, before we can frame ideas of what either of these things are. We learn all our possibilities by way of experience. When a particular movement, having once occurred in a random, reflex, or involuntary way, has left an image of itself in the memory, then the movement can be desired again, proposed as an end, and deliberately willed. But it is impossible to see how it could be willed before" (p. 487).

"If I will to utter the word *Paul* rather than *Peter*, it is the thought of my voice falling on my ear, and of certain muscular feelings in my tongue, lips, and larynx, which guide the utterance. All these are incoming feelings, and between the thought of them, by which the act is mentally specified with all possible completeness, and the act itself, there is no room for any third order of mental phenomenon. There is indeed the *fiat*, the element of consent, or resolve that the act shall ensue. This, doubtless, to the reader's mind, as to my own, constitutes the essence of the voluntariness of the act. This *fiat* will be treated of in detail further on. It may be entirely neglected here, for it is a constant coefficient, affecting all voluntary acts alike, and incapable of serving to distinguish them. No one will pretend that its quality varies according as the right arm, for example, or the left is used.

"*An anticipatory image, then, of the sensorial consequences of a movement, plus, (on certain occasions) the fiat that these consequences shall become actual, is the only psychic state which introspection lets us discern as the forerunner of our voluntary acts*" (p. 501).

Coming, now, to the point upon which the whole discussion hinges—the relations of "ideo-motor" action to voluntary action, he says :

"The question is this: *Is the bare idea of a movement's sensible effects its sufficient mental cue, or must there be an additional mental antecedent, in the shape of a fiat, decision, consent, volitional mandate, or other synonymous phenomenon of consciousness, before the movement can follow?*

"I answer: Sometimes the bare idea is sufficient, but sometimes an additional conscious element, in the shape of a fiat, mandate, or express consent, has to intervene and precede the movement. The cases without a fiat constitute the more fundamental, because the more simple, variety. The others involve a special compli-

cation, which must be fully discussed at the proper time. For the present let us turn to *ideo-motor action*, as it has been termed, or the sequence of movement upon the mere thought of it, as the type of the process of volition."

[We have seen, above, that our author speaks of the fiat as "the essence of the voluntariness of the act . . . a constant coefficient, affecting all voluntary acts alike." If this be true, I admit that I am unable to understand how acts from which it is absent can be taken as "the type of the process of volition." Let us see what sort of facts are to be considered under this head]:

"Wherever movement follows *unhesitatingly* and *immediately* the notion of it in the mind, we have ideo-motor action. We are then aware of nothing between the conception and the execution. All sorts of neuro-muscular processes come between, of course, but we know absolutely nothing of them. We think the act, and is done; and that is all that introspection tells us of the matter. Dr. Carpenter, who first used, I believe, the name of ideo-motor action, placed it, if I mistake not, among the curiosities of our mental life. The truth is that it is no curiosity, but simply the normal process stripped of disguise. While talking, I become conscious of a pin on the floor, or of some dust on my sleeve. Without interrupting the conversation, I brush away the dust, or pick up the pin. I make no express resolve, but the mere perception of the object, and the fleeting notion of the act, seem of themselves to bring the latter about. Similarly, I sit at table after dinner, and find myself from time to time taking nuts or raisins out of the dish and eating them. My dinner properly is over, and in the heat of the conversation I am hardly aware of what I do, but the perception of the fruit and the fleeting notion that I may eat it, seem fatally to bring the act about. There is certainly no express fiat here, any more than there is in all those habitual goings and comings and rearrangements of ourselves, which fill every hour of the day, and which incoming sensations instigate so immediately that it is often difficult to decide whether not to call them reflex rather than voluntary acts. We have seen in Chapter IV that the intermediate terms of an habitual series of acts leading to an end are apt to be of this quasi-automatic sort. . . .

"In all this the determining condition of the unhesitating and resistless sequence of the act seems to be *the absence of any conflicting notion in the mind*. Either there is nothing else at all in the mind, or what there is does not conflict. The hypnotic subject realises the former condition. Ask him what he is thinking about, and ten to one he will reply 'nothing.' The consequence is that he both believes everything he is told, and performs every act that is suggested." (Pp. 522-523.)

I have no fault to find with the above statement of the facts, nor do I think that Professor James at all exaggerates the importance of the part played by ideo-motor action in our conduct. Its relations to voluntary action, however, require a little further examination.

It is probably true, in a sense, that ideo-motor action is, psychologically, a more simple process than action with a conscious motive, but it does not follow that it is more fundamental. When the skilful pianist plays a difficult piece of music at sight, his attention is fixed on the notes before him, and his fingers go instinctively to the right keys, without any more of a conscious "fiat" than the general

purpose to play the piece as it is written. So far as the movements are concerned the psychological process is infinitely simpler than when, as a beginner, he practised his exercises with his mind fixed on the position and movements of his fingers, but I think there can be no doubt that the latter is the fundamental thing. Now, this is a type of the origin of ideo-motor action. It is, I think, invariably developed out of voluntary action. We learn to walk, to talk, to write, with close attention and infinite labor, but by repetition the channels in our nervous systems get so worn that less and less of effort is required in forcing the passage, until, finally, any sensation or thought habitually associated with the act is sufficient, in the absence of some inhibitory force, to instigate the movement. If this be true, voluntary, not ideo-motor action, must be considered the fundamental thing. I cannot think of any exception to this, unless primarily instinctive acts should be classed as ideo-motor. Much might be said in favor of this view, but this hardly seems the place for such a discussion. It will be sufficient to admit that, in such cases, acts which were originally performed from an unreasoning impulse may come to be done with a view to their consequences.

The involuntary character of ideo-motor acts is recognised, elsewhere, by Professor James himself :

"A man says to himself, 'I must change my shirt,' and involuntarily he has taken off his coat, and his fingers are at work in their accustomed manner on his waistcoat buttons." (P. 519.)

Our so-called absent-minded acts are ideo-motor. I have lately taken to carrying the key to a room, where I have frequent occasion to go, in my pocket, and for some time after I began doing so I invariably went to the drawer where I had formerly kept it, when I had occasion to go to the room, not because I supposed the key to be there, but because that action had become, in my mind, an integral part of the process of visiting the room.

If there remains, in any one's mind, a doubt of the involuntary character of such acts as we have been considering, it should, I think, be dissipated by the consideration of the notorious fact that they are often performed, not only without our will, but against our will. Every one who has undertaken to break himself of bad habits must be familiar with this. We commit the faults we are trying to correct during the practice of exercises undertaken for that express purpose. Ideo-motor and voluntary action are most intimately associated and shade off imperceptibly into each other, but they are not the same, and, instead of the former being the type of the latter, I think it is evident that pure ideo-motor action is not voluntary at all.

The simplest type of voluntary action seems to be when it follows a desire that is not opposed by any contradictory feeling. Of this sort, and not, strictly, ideo-motor, seems to me to be the action described in the following passage by Professor James :

"We all know what it is to get out of bed on a freezing morning, in a room without a fire, and how the very vital principle within us protests against the ordeal. Probably most persons have lain on certain mornings for an hour at a time unable to brace themselves to the resolve. We think how late we shall be, how the duties of the day will suffer ; we say, 'I must get up ; this is ignominious,' etc. ; but still the warm couch feels too delicious, the cold outside too cruel, and resolution faints away and postpones itself again and again, just as it seemed on the verge of bursting the resistance and passing over into the decisive act. Now, how do we ever get up under such circumstances? If I may generalise from my own experience, we more often than not get up without any struggle or decision at all. We suddenly find that we *have* got up. A fortunate lapse of consciousness occurs ; we forget both the warmth and the cold ; we fall into some reverie connected with the day's life, in the course of which the idea flashes across us, 'Hollo, I must lie here no longer'—an idea, which at that lucky instant awakens no contrary or paralysing suggestions, and consequently produces immediately its appropriate motor effects. It was our acute consciousness of both the warmth and the cold during the period of struggle, which paralysed our activity then and kept our idea of rising in the condition of *wish* and not of *will*. The moment these inhibitory ideas ceased, the original idea exerted its effects.

"This case seems to me to contain, in miniature form, the data for an entire psychology of volition. It was, in fact, through meditating on this phenomenon in my own person that I first became convinced of the truth of the doctrine which these pages present, and which I need here illustrate by no further examples." (P. 524.)

Judging by Professor James's statement of the case, and comparing it with my own experience in similar circumstances, I should say that what he had in mind at the critical moment was not merely the thought of the act of getting up, but the thought that he ought to get up. The act, accordingly, is done with a motive, which, for the moment, meets with no opposition. To class it, as I understand Professor James to do, with acts done automatically, without motive or purpose, seems to me to be losing sight of a very important distinction.

I have quoted the greater part of what Professor James has to say on this head, partly on account of its importance in his argument and partly to enable my readers to decide for themselves what his opinion really is as to the relations of ideo-motor and voluntary action—a point on which I am not clear in my own mind. On the one hand, as we have seen, he speaks of the former as the type of the latter ; on the other, he calls some ideo-motor acts involuntary.

My own opinion is, that those acts, and no others, are properly called voluntary, which are done purposely, intentionally, by choice. When this is the case, no matter how simple or how unhesitating the action, it is voluntary ; when it is not the case, no matter how complicated the act or what its results, it is involuntary.

Passing to the subject of action after deliberation, I will not attempt to follow Professor James's discussion in detail, but, before taking up the points in which I differ from him, will call attention to some points which he passes over, in regard to the grounds of deliberation.

Deliberation may be in regard to the means by which we may attain an end already desired, or in regard to the ends themselves. In the former case, we may be in doubt whether the thing desired is attainable, or, which amounts, practically, to much the same thing, whether it is attainable without the sacrifice of something which we value more highly, as when an honest man doubts whether he can obtain an office which he would like by honorable means. Or, it may be a question of the best means of securing an object thought of as attainable in various ways, as when a man hesitates as to the route he will take in a journey on which he has determined. In cases like these, in which the hesitation is merely on intellectual grounds, the decision, when our doubts are resolved, is made without effort. Even in cases in which we are obliged to act in important matters on insufficient knowledge, although there may be a feeling of reluctance to commit ourselves to what may turn out to be a wrong course of action, there is none of the sense of renunciation of which we are often conscious in the other class of choices.

When two desirable objects are clearly perceived to be incompatible, we only hesitate when the opposing motives are, for the time being, of equal weight in our minds. If the choice is between matters that we feel to be of little importance, we may be willing, without any decided preference, to let the matter be decided by chance. A change in the way in which the motives are presented to the mind, or in our mood, may give such a preponderance to one set of motives, that a decision, which, a short time before, seemed impossible, shall be made without misgiving. The opposing motives, for the time, sink into insignificance, and we are conscious of no effort in renouncing the one good for the other.

When, on the other hand, at the moment of decision, two incompatible goods are strongly desired, and the inclination to one only gains a slight preponderance over the other, the renunciation of one for the other is only made with a feeling of effort. It is in regard to the circumstances under which this feeling arises that I must next take issue with Professor James.

The view of the matter which seems to me unsatisfactory is stated as follows:

"The states of mind which normally possess the most impulsive quality are either those which represent objects of passion, appetite, or emotion,—objects of instinctive reaction, in short; or they are feelings and ideas of pleasure or of pain; or ideas which for any reason we have grown accustomed to obey, so that the habit of reacting on them is ingrained; or, finally, in comparison with ideas of remoter objects, they are ideas of objects present or near in space or time. Compared with these various objects, all far-off considerations, all highly abstract conceptions, unaccustomed reasons, and motives foreign to the instinctive history of the race, have little or no impulsive power. They prevail, when they ever do prevail, *with effort*, and the normal, as distinguished from the pathological, *sphere of effort is thus found whenever non-instinctive motives to behavior are to rule the day.*" (P. 536.)

Of course, if we proceed *a priori* and define the line of least resistance as the line that is followed, the physical law must hold good in the mental sphere. But we *feel*, in all hard cases of volition, as if the line taken when the rarer and more ideal motives prevail were the line of greater resistance, and as if the line of coarser

motivation were the more pervious and easy one, even at the very moment when we refuse to follow it. He who under the surgeon's knife represses cries of pain, or he who exposes himself to social obloquy for duty's sake, feels as if he were following the line of greatest temporary resistance. He speaks of conquering and overcoming his impulses and temptations.

"But the sluggard, the drunkard, the coward, never talk of their conduct in that way or say they resist their energy, overcome their sobriety, conquer their courage, and so forth. If in general we class all springs of action as propensities on the one hand and ideals on the other, the sensualist never says of his behavior that it results from a victory over his ideals, but the moralist always speaks of his as a victory over his propensities. The sensualist uses terms of inactivity, says he forgets his ideals, is deaf to duty, and so forth; which terms seem to imply that the ideal motives *per se* can be annulled without energy or effort, and that the strongest mere traction lies in the line of the propensities. The ideal impulse appears, in comparison with this, a still small voice which must be reinforced to prevail. Effort is what reinforces it, making things seem as if, while the force of propensity were essentially a fixed quantity, the ideal force might be of various amount. But what determines the amount of the effort when by its aid an ideal motive becomes victorious over a great sensual resistance? The very greatness of the resistance itself. If the sensual propensity is small, the effort is small. The latter is *made great* by the presence of a great antagonist to overcome. And if a brief definition of ideal or moral action were required, none could be given which would better fit the appearances than this: *It is action in the line of the greatest resistance*" (pp. 548-549).

It seems to be plainly implied in the foregoing passages that the feeling of effort, in the sense in which the term is used here, only arises in the case of a conflict between "ideals" and "propensities," in which the former prevail. This does not strike me as in accordance with the facts. So far as I can see, all that is necessary is that the alternative which is renounced should still be strongly desired. In fact, in another passage, Professor James seems to admit that such may be the case:

"Whether it be the dreary resignation for the sake of austere and naked duty of all sorts of rich mundane delights, or whether it be the heavy resolve that of two mutually exclusive trains of future fact, both sweet and good, and with no strictly objective or imperative principle of choice between them, one shall forevermore become impossible, while the other shall become reality, it is a desolate and arid sort of act, an excursion into a lonesome moral wilderness" (p. 534).

The second of these supposed cases does not seem to involve a choice between more and less ideal motives, and I think the experience of every one will supply him with instances enough in which we are called upon to decide how we shall use our time or our money between things which seem equally legitimate objects of desire, neither of which can be easily given up. Shall a man devote his leisure time to literature, science, travel, or social intercourse; his limited means to the purchase of books or works of art; shall he get the good of the present hour, at the risk of future destitution, or spend his time and hoard his means for provision against a future day which he may never see? In such cases as these, one set of motives need be no more instinctive than the other, but I fancy that there are few who have not experienced a feeling of effort in making such decisions.

But even in choices between "ideals" and "propensities," I do not think it is true that the feeling of effort is confined to the cases in which the former prevail. Nothing is more instinctive than the love of life; nothing more ideal than the love of truth; yet I do not believe that it was without an effort that Galileo repudiated his deepest convictions, nor do I doubt that those martyrs who were made of sterner stuff found it easier to die for the truth than to deny it. I do not even believe that non-instinctive motives always prevail with effort. An honest man need not be conscious of an effort in refraining from pocketing his neighbor's spoons when he has the opportunity. Patriotism, benevolence, a sense of honor, religious principle may take such possession of the mind of a man who is by no means destitute of feelings of self-interest that there will not be a moment's hesitation if they conflict. Benjamin Franklin had a very keen eye for the main chance, but I do not believe that he would have felt a pecuniary bribe to betray his country as very much of a temptation. I have no doubt that at the present time there are among Professor James's pupil's men who "scorn delights, and live laborious days," joyfully and enthusiastically, for the love of knowledge or the hope of fame, for intellectual or physical preëminence. What would a member of the Harvard foot-ball team say to the proposition that his resolution to give up his wine and cigars rather than that the athletic glory of his *alma mater* should be dimmed was "a desolate and arid act"? This is a hard enough world as it is, but it would be much harder if the pursuit of the ideal were always such dreary business as seems to be implied in the passages quoted above.

I think, then, it is sufficiently clear that the feeling of effort in making a decision does not either uniformly or exclusively accompany those decisions in which the less instinctive, more ideal motive carries the day. Nevertheless, it certainly is true that in cases in which what we feel to be the higher motive prevails, we do say and feel that we have been victorious; that our efforts have overcome the temptation. The reason of this, it seems to me, is that we feel that we are more truly ourselves in our calm, dispassionate moments, than in the presence of a powerful temptation. Even in the struggle, we feel that if we do what we have condemned beforehand, we shall regret it afterward.

I do not, accordingly, believe that "action in the line of greatest resistance" has any more place in the moral than the physical world. If a man, at the moment of decision, loves ease more than fame, or fears death more than dishonor, he will follow the prompting of the stronger feeling as surely as the stone falls to the ground or the sparks fly upward. The whole aim of moral education is to render the line of our ideals that of least resistance—to make it easy to do right, and hard to do wrong. It is not completely successful until right action is a delight. I suspect it may have occurred to some of my readers, after having successfully resisted the temptation to do some discreditable act, to feel, not proud of the victory, but ashamed that it should have cost a struggle.

Of the section on "Pleasure and Pain as Springs of Action" I will only say

that it does not seem to me to be pertinent to the subject under discussion. To show, as Professor James does, that reflex, instinctive, and emotional acts are not excited by the thought of the pleasure or pain that is to result from them, throws no light on the phenomena of will, if we follow him in considering them all primary performances, as contrasted with voluntary movements, which are secondary functions of our organism (p. 487). Whether we are to call all the incentives to voluntary action pleasures and pains or not, does not seem to me very important. Professor James seems to think, for example, that sympathy, as a motive, is an instance to the contrary. I should say that, in my own case, sympathy is a pleasure in the happiness and pain in the suffering of others, but if he does not find it so, and thinks I am mistaken in so thinking, I will not quarrel with him. But it is important that we should not lose sight of the distinction between voluntary and involuntary actions. When we wish, desire, choose, prefer, to do an act, rather than to abstain from acting or to do something else, then, and only then, in my view of the matter, is it voluntary.

I have already discussed the matter of ideo-motor action in this relation. In the case of morbid impulsion, which he instances, the condition seems to be much the same as in many cases of instinctive or habitual action. If there is no opposing motive, the impulse produces its appropriate muscular actions. I had once under my observation an insane girl who had an uncontrollable impulse to tear her clothing into strips, tie knots in the ends of the strips and bite them off. She realised perfectly well what she was doing, and talked very sensibly about it. She would say she didn't know why she did it; it was a great pity; her mother could not afford to have the clothing destroyed, but she couldn't help it, all the time going on with the work of destruction. She was not by any means destitute of feelings of delicacy, but that did not deter her from destroying her clothing to the last rag if it was not sooner replaced. Although she did not appear to take any pleasure in the work of destruction, I do not doubt that it would have been intolerably painful for her to refrain from it for any length of time. A person contending against such an impulse is like one hanging by his hands over a precipice. He does not expect any pleasure in letting go, but the effort of holding on becomes intolerable, and he very likely lets go when he is not physically incapable of holding on a little longer.

We may now proceed to consider the author's views on the subject of the relation of Attention to Will.

"In closing in, therefore, after all these preliminaries, upon the more *intimate* nature of the volitional process, we find ourselves driven more and more exclusively to consider the conditions which make ideas prevail in the mind. With the prevalence, once there as a fact, of the motive idea, the *psychology* of volition properly stops. The movements which ensue are exclusively physiological phenomena, following according to physiological laws upon the neural events to which the idea corresponds" (pp. 559-560).

"We have now brought things to a point at which we see that attention with effort is all that any case of volition implies. *The essential achievement of the will,*

*in short, when it is most 'voluntary,' is to attend to a difficult object and hold it fast before the mind. The so-doing is the *fiat*; and it is a mere physiological incident that when the object is thus attended to, immediate motor consequences should ensue" (p. 561).*

"*Effort of attention is thus the essential phenomenon of will.* Every reader must know by his experience that this is so, for every reader must have felt some fiery passion's grasp. What constitutes the difficulty for a man laboring under an unwise passion of acting as if the passion were unwise? Certainly there is no physical difficulty. It is as easy, physically, to avoid a fight, as to begin one; to pocket one's money, as to squander it on one's cupitudes; to walk away from, as towards a coquette's door. The difficulty is mental; it is that of getting the idea of the wise action to stay before the mind at all." (Pp. 562-563.)

Now, nothing can be clearer to my mind than that in such a case as this, it is nothing but the presence of the idea of the wise action in the mind that causes us to hesitate. Without it, we should follow the dictates of passion immediately, without hesitation or misgiving. So far is it from being universally true, as argued by Professor James in the following sentences, too long for quotation, that reasonable ideas will always prevail if they can get a fair hearing, that it has passed into a proverb that "the woman who deliberates is lost." When we have decided beforehand how we ought to act in the presence of a temptation, everybody knows that the only safe course, when the emergency arises, is to act first, as we had resolved, and reflect afterwards. That is not the time for a quiet hearing of the arguments which oppose our passion. Reason may, it is true, come out victorious in such a contest, but the advantage of position is with the enemy.

But what is the process in case that, after deliberation, we follow our propensity rather than our ideal? It seems to me that it is the rarest thing in the world for us to drop the motive to the contrary course out of sight. Usually, one of two things happens: either we persuade ourselves for the time that we may escape the consequences of our folly, or passion gets such a mastery that we determine to brave them. The difficulty is not at all in getting the reasonable course of action to stay before the mind; it is that, in comparison with the opposing motive, it does not seem desirable, as when we consider both dispassionately.

Granting, for the sake of the argument, that we may, by an effort of attention, exclude one or the other of two sets of motives, between which we are undecided, from the mind, the question still remains, how we come to make this effort of attention. According to Professor James: "We never make an effort to attend to an object, except for the sake of some remote interest which the effort will serve." (Vol. I, p. 416.) That is, if I understand him, voluntary effort is effort prompted by desire. The schoolboy, studying a dull lesson, recalls his wandering thoughts to the book before him again and again, because, for one reason or another, he wishes to learn his lesson. His father, in his shop or his office, takes pains to fix in his mind a multitude of uninteresting details—the prices of various commodities, the names, residences, occupations, and tastes of a multitude of persons in them-

selves indifferent to him, because he expects and wishes to turn the knowledge to pecuniary profit. Many unwelcome things force themselves on our attention, but my readers must have differently constituted minds from mine if they can imagine themselves making an effort to attend to a thing which at the same time they wish to banish from the mind.

The relation of attention to will, therefore, seems to me precisely the reverse of that asserted by Professor James. Voluntary attention, like voluntary muscular action, is the *result* of will. If we desire to make a movement, and nothing hinders, the movement comes to pass. If we desire to attend to something, we attend to it, for the moment, at least, and the relation of the desire to its accomplishment seems to me strictly analogous in the two cases. In the one case, the muscular movement, in the other, the attention, is thought of as the means of securing the desired end. If either comes to pass in any other way than as a means to a desired end, I deny its voluntary character.

When Professor James says, as already quoted, that "the essential achievement of the will . . . is to attend to a difficult object and hold it fast before the mind," it is evident that the object to which he refers is not the action itself, but its consequences. When I hesitate, for instance, whether or not to make a purchase, which I feel I can ill afford, it is not the action of taking the money out of my pocket and handing it over that occupies my thoughts, but the idea, on the one hand, of the pleasure of possessing the desired object, and, on the other, of the inconvenience of not having the money it would cost. Now, whether fixing our attention on the consequences of an act shall have any tendency to excite movements or not, and if so, what the movements shall be, depends on the state of our feelings in regard to them. The thought that if I put a paper in the fire it will be burned, or that if I throw a stone through my window it will break the glass, excites no movement, because I have no desire for either result. If a young lady has an offer of marriage, the movements which it will excite will not depend on the amount of attention she gives it, but on her disposition in regard to the person making it. That is, while in ideo-motor action the mere thought of the movement is sufficient to set off the nervous mechanism in such a way as to produce it, in such a case as this, the movements are determined, not by the thought of the words of acceptance or refusal, but by the subject's feeling in regard to the results which will follow their utterance—an essentially different state of affairs.

Professor James qualifies the statements made in the passages quoted above, as follows :

" It is unqualifiedly true that if any thought *do* fill the mind exclusively, such filling is consent. The thought, for that time, at any rate, carries the man and his will with it. But it is not true that the thought *need* to fill the mind exclusively for consent to be there; for we often consent to things, while thinking of other things, even of hostile things; and we saw in fact that precisely what distinguishes our 'fifth type' of decision from other types (see p. 534) is just this existence with the

triumphant thought of other thoughts which would inhibit it but for the effort which makes it prevail. . . . So that although attention is the first and fundamental thing in volition, *express consent to the reality of the thing attended to* is often an additional and quite distinct phenomenon involved.

"The reader's own consciousness tells him, of course, just what these words of mine denote. And I freely confess that I am impotent to carry the analysis of the matter any farther, or to explain in other terms of what this consent consists. It seems a subjective experience *sui generis*, which we can designate, but not define." (P. 568.)

I have, perhaps, already said as much as is necessary in regard to the feeling of effort. We have it whenever we renounce what, at the time, we strongly desire. Professor James makes a mystery here of what seems to me a very plain and simple matter. I should use a stronger word than "consent" to express my state of mind in such a case as he is considering. So far as my consciousness informs me, when I come to a difficult decision, it is always by a choice or preference of one alternative over the other. Both may be, in themselves, undesirable; but in comparison, one must be more desirable than the other. I do not wish to lose my money, but I would rather lose my money than my life. The preference of one thing to another may be an experience *sui generis* and incapable of further analysis, but it is as intelligible as anything in the working of our minds.

In what does the "fiat," of which so much is said, consist? I presume I shall not carry the assent of all, perhaps not of many, of my readers in what I am about to say, but I am unable, in my own case, to find anything more or less in it than the combination of desire with the feeling of power that the contemplated act may take place *now*. It seems to me that the line of argument by which Professor James disposes of the feeling of innervation is equally applicable here. When we have this combination of feelings we have volition, and under no other circumstances. If we suppose the "fiat" to be something distinct, how can we distinguish it from that without which we never experience it, and which we never experience without it? We are so made that when we wish and feel able to act we act, and the insertion of any additional factor is an entire superfluity.

To recapitulate: Professor James's argument, as I understand it, is that, inasmuch as we perform a multitude of acts which are incited merely by the thought of the movement, without respect to its consequences, and when the idea of an act takes entire possession of the mind, the act is inevitably performed, it follows that attention to the act itself—that is, the bodily movements—is the only essential constituent of its voluntary nature, and that desire or aversion, in respect to its consequences, is, in this regard, only an accidental and superfluous accompaniment, which, so far as it can be considered operative at all, acts only by directing our attention.

I hold, on the other hand, that, by the well-established use of language, only those acts are termed voluntary which are performed intentionally, purposely, by preference or choice. This choice may be between two or more courses of action,

or between action and inaction, but in either case it is determined, not by the thought of the action itself, but by our desire or preference of its anticipated results. The amount of attention directed to the act itself may be reduced to a minimum without impairing its voluntary character, provided it is done with a conscious purpose.

This brings us back to the statement of the case by Professor James, with which we started out. Our choices or preferences are merely the predominances of our desires, or, what is the same thing looked at from the other side, our aversions. Desire of the result, not attention to the means of securing it, is, to my mind, the fundamental thing in voluntary action.

Professor James does not attempt any exhaustive discussion of the question of "Free Will." He considers the question insoluble on logical grounds, and after a very clear and fair statement of the scientific argument for determinism from the unity and continuity of nature, decides in favor of the hypothesis of freedom on ethical grounds, the nature of which is indicated in the following passages :

"The most that any argument can do for determinism is to make it a clear and seductive conception, which a man is foolish not to espouse, so long as he stands by the great scientific postulate that the world must be one unbroken fact, and that prediction of all things without exception must be ideally, if not actually, possible. It is a *moral* postulate about the Universe, the postulate that *what ought to be can be, and that bad acts cannot be fated, but that good ones must be possible in their place*, which would lead one to espouse the contrary view. But when scientific and moral postulates war thus with each other and objective proof is not to be had, the only course is voluntary choice, for scepticism itself, if systematic, is also voluntary choice. If, meanwhile, the will be undetermined, it would seem only fitting that the belief in its indetermination should be voluntarily chosen from amongst other possible beliefs" (p. 573).

"*The question of fact in the free-will controversy is thus extremely simple.* It relates solely to the amount of effort of attention or consent which we can at any time put forth. Are the duration and intensity of this effort fixed functions of the object, or are they not? Now, as I just said, it *seems* as if the effort were an independent variable, as if we might exert more or less of it in a given case. When a man has let his thoughts go for days and weeks until they culminate at last in some particularly dirty or cowardly or cruel act, it is hard to persuade him, in the midst of his remorse, that he might not have reined them in; hard to make him believe that this whole goodly universe (which his act so jars upon) required and exacted it of him at that fatal moment, and from eternity made aught else impossible. But, on the other hand, there is the certainty that all his *effortless* volitions are resultants of interests and associations, whose strength and sequence are mechanically determined by the structure of that physical mass, his brain : and the general continuity of things and the monistic conception of the world may lead one irresistibly to postulate that a little fact like effort can form no real exception to the overwhelming reign of deterministic law. Even in effortless volition we have the consciousness of the alternative being also possible. This is surely a delusion here ; why is it not a delusion everywhere?" (Pp. 571-572).

If I were seeking nothing more than a dialectical victory, it would be sufficient to say that Professor James, on his own premises, concedes the whole question in the closing sentences above quoted. As we have already seen, he insists, repeatedly and emphatically, that effort of will is only put forth on the side of our ideals, against our instincts and propensities; that we never resist our energy, overcome our courage, or conquer our sobriety. If we accept this as the fact, it must, of course, follow that all our bad decisions are decisions without effort, as it certainly is the fact that most of them are, and we are thus, at one stroke, deprived of the only reason, according to our author, for questioning the doctrine of determinism.

Taking the ground that I do, that Will is nothing but the combination of feelings of desire and ability, it evidently follows that the question is merely in regard to the freedom of desire. That is, are our likings and dislikings, either absolutely or relatively to each other, under our control? Of course we are free from external coercion in such matters. No one can compel us to like the taste of castor oil better than that of honey, the odor of onions than that of violets, the braying of an ass than the touch of a master hand on the keys of the organ, but can we compel ourselves to do it? I do not of course deny that we can, by habit and association, work great changes in our tastes. The question is as to our ability to change them abruptly, by an effort of attention, or of consent, or what not. There is no doubt that it would be very convenient if we could gain such control of our feelings that the old saying might be made to read, even at the expense of rhyme, "What can't be cured must be *enjoyed*," but I presume few will maintain that their will can accomplish so much as that. Yet such is the only meaning which, to my mind, the assertion can have that we can, by such effort, give the preponderance to what is, in itself, the weaker motive. What we call motives are nothing but our likings and dislikings. It may be thought by some a confession of weakness of will, but I am unable to imagine myself voluntarily doing an act which I expected would have unpleasant consequences to myself, unless I felt, at the time, that the results of not doing it would be still more unpleasant. And, although I have abundant reason to wish for a clearer perception of what is good, I have no desire for such freedom as will enable me to choose what seems to me the worse.

This is all I have to say at present in criticism of the position of Professor James in regard to this subject. Before closing, however, I will briefly call attention to an aspect of the matter which does not seem to me to have attracted the attention it deserves.

We have seen that an essential constituent of every volition is a desire for a state of consciousness different from the present. But we cannot desire that of which we have no conception, consequently it follows that imagination must play a part in every motive to action.

Unless I am much mistaken, what we call strength of will depends very largely on imaginative power. It is not altogether easy to distinguish this quality from obstinacy—the disposition to persist in a course once undertaken, independently of its

wisdom. But when we find a man who, having once settled upon a reasonable course of action, pursues it to the end, in spite of difficulties and discouragements, it will be found, I think, that the distinguishing quality of his mind, as contrasted with the fickle and vacillating, consists in the power of realising, at all times, the remote, as well as the immediate consequences of his acts. This deters him from hastily entering on courses of action which he will not be able to carry though, and when temptations to turn aside assail him, this enables him to see that they are not worthy of attention in comparison with the motives for persistence.

We have a natural propensity to be more affected by objects that are present to our senses than by those that are absent, by what we expect to occur immediately than what is in the distant future. The child who idles away the time in which he should perform an allotted task, the savage who spends a time of plenty in sloth and gluttony, both know that the time is coming when they will have occasion to regret their negligence, but they are incapable of realising how they will feel when it comes. Many a soldier, who enlisted with a heart overflowing with valor, has felt a change which he could hardly justify by logic come over his estimate of the comparative value of military glory and a whole skin, when he came under fire.

Kinglake, in his "Eothen," relates that on one occasion he engaged some of the wandering Arabs of the desert, who have an invincible repugnance to cities, to transport him and his baggage to Damascus. The bargain was explicit, and they fully understood what was expected of them. As they came in sight of the city, however, they grew uneasy, and began to beg to be released from their agreement. The nearer they approached, the more their distress increased, till they finally left their camels and fled into the desert, choosing rather to lose not only their wages but their property than to enter the hated walls. He remarks that he has no doubt of their sincerity at the time the bargain was made, but believes they were incapable of imagining, what would be their feelings when they came to carry it out.

St. Paul speaks of enduring "as seeing him who is invisible." The psychology of strength of will is condensed into that sentence. The man who fully realises the unseen and remote is not at the mercy of every fresh impression on his senses. He may have little obstinacy, and be always ready to recede from an opinion or a course of action that turns out to have been ill-advised. The objects of his aspiration may be worthy or unworthy, real or illusory. But when he has counted the cost, and decided what is most to be desired, he moves on, steadfastly and unswervingly, to the consummation of his purpose. Sloth does not enchain him; passion does not seduce him; difficulty and danger do not daunt him.

"*Si fractus illabatur orbis
Impavidum ferient ruinæ.*"

W. L. WORCESTER.

BOOK REVIEWS.

A. BRONSON ALCOTT, HIS LIFE AND PHILOSOPHY. By F. B. Sanborn and William T. Harris. Boston : Roberts Bros. 1893.

This is one of the most noteworthy biographies of this biographical year. Mr. Alcott was a unique man, and during his long life of nearly ninety years, while always retaining his intense personality, he was yet the representative of much that was highest and holiest in thought, and noblest in action in his times.

Perhaps nowhere but in New England could the same varied influences have been found and blended into a character so unique and so harmonious in itself. The intense religious life of New England was not so much emotional as moral and philosophical. The delight in the perfect logical sequence of the "plan of salvation" developed a certain metaphysical ability even in the plainest folk. It has well been said that the Calvinist was at once an aristocrat and a democrat. He who was "elected before the foundations of the world" to the highest honors of Heaven, could not feel abased before any earthly dignity, and this gave a sense of self-respect and conscious dignity which suited with the equality of all men before the law. So that not alone from his English ancestry, but from the high thinking of his companionship, Mr. Alcott gained the fine manners which distinguished him. He resembled the Scotch pedlar who, as King James said, "could put his pedigree in his chest, when engaged in his calling, but bring it out when a higher occasion required."

Mr. Sanborn has shown the development of Mr. Alcott's thought and character as even those who have long known him hardly understood it. He passed through many phases of life and thought, and distilled from all the fine spirit of life, which, if at times a little intoxicating, had much of ripe, sweet wisdom, which he concentrated into the Orphic sayings, which remain unexhausted after many years of study.

Belonging to his age, and yet a perpetual protest against many of its tendencies, it is difficult to estimate his influence rightly, and to strike the true balance between the ardent faith of his admirers on the one hand, and, on the other, the indifference, not to say contempt, not of his enemies, for his nature was not prone to warfare, but of those who could not see the real man. But when we remember that among

those admirers were such men as Emerson, Thoreau, Channing, Hedge, Harris, and others of the highest thinkers of his day, with such women as Margaret Fuller and Elizabeth Peabody, certainly nobody can pass by this life carelessly, without seeking to understand how the pedlar-boy of Connecticut became the Philosopher of Concord.

Fortunately, Mr. Alcott believed in records of life and thought, and held his own to be of value, and hence his biographers have ample material from which to draw his portrait. It is good that his features have been painted by friendly, yet critical pens, for it is not cold dissection, but loving insight which reveals the mysteries of human life.

Born in Connecticut, in a farmer's home, but evidently inheriting the constitution and fine brains of an old English ancestry, Bronson Alcott passed his early life in the country, and then started on his career as a pedlar. But his journeyings in this humble capacity were made to minister to his mental development, for he observed men and society, he read all the books he could lay his hand on, and still more, he was thrown into temptation and learned to know his own strength and weakness. He confesses to have committed, on one of these journeys, the only serious transgression of moral law of which probably he was ever guilty in his long and innocent life. Tempted by the desire of seeing the cities and of appearing in fine clothes, for he always had a great love of handsomeness, he used the money, which should have paid for his stock, to gratify his taste, and then, repentant and ashamed, went home to grieve his mother's heart. The sense of this error remained with him for long years and may have influenced him in his working out of the problem of evil, which, Mr. Harris shows, was the basis of his philosophy.

His next pursuit was that of teaching, equally characteristic of New England life, and here he found his true calling. At first, while his diaries are full of earnest thought, they do not reveal the strong peculiarities and extreme following out of new ideas which appeared later. His style of writing is clear and reasonable, and his methods of teaching appear to have met with acceptance. He had already to some extent anticipated the work of Theodore Parker in Theology, and his views of education were akin to those of Pestalozzi and Froebel, as yet unknown to him.

He believed in attraction for the child, rather than coercion, and strove to educate the whole nature, rather than merely to instruct the intellect. The influence of the "Friends," with whom he had passed some time, led him to the doctrine of the "Inner Light," which was strongly in harmony with his own nature.

As he went on developing his own plans of education, he became still more separated from the common traditions, and when he attempted to carry out his ideas fully in the Temple School in Boston, his extreme methods in discipline and instruction failed to win the approval of the parents, or to influence the children as deeply as he expected. It would be very interesting if some of his pupils, now having full experience of life, would tell us how much of value remained to them from his lessons. In addition to the peculiarities of his method, he ran counter to the despic-

able prejudices of the day, by admitting colored children to the school, and he was assailed in the newspapers with wholly unpardonable virulence. He was warmly defended by Mr. Emerson, who always believed in him, loved him, and was his good providence in every emergency.

The story of Mr. Alcott's marriage to one who comprehended his high thought and loved him devotedly through all trials, brightens the somewhat sad history of his failures; and the sonnets, written in old age, in which he recalls those days of early love, are clear and sweet as the song of the oriole amid the blossoming of May.

It was during his early married life that he seemed to lose the just estimate of practical affairs and not to hold an even balance between theory and practice. To this period belong the anecdotes of his odd sayings and doings. He afterwards could look back on these extravagances with a smile, remembering the chill of a voyage on a Hingham steamboat when he was "clothed all" in linen, because he would not deprive the sheep of their covering, and lending money to unknown people without even asking their names, his faith in its return in some cases being fully justified.

The most serious of these experiments, which came near to wrecking his sanity and life, was the attempted colony at Fruitlands, of which his gifted daughter has told the story with all possible humor and pathos in her sketch, called "*Transcendental Wild Oats*."

But, during all this time he was fully interested in the great moral crusade against slavery, seeing, as clearly as Garrison and Parker, that it was a burden of sin that must be cast off before the nation could be led to righteousness. He took a brave part in the efforts to redeem the victims of the Fugitive Slave Law.

He heartily accepted the movement for the intellectual advancement of women and their admission to the exercise of the right of suffrage, for his pure and spiritual nature made him understand women as fully as they believed in him. There was always a good proportion of women in his classes for conversation, and to the last, young women found in his utterances at the Concord School the same sense of a fresh, reviving spiritual atmosphere that their elders had found from his words, (and they were the same words,) thirty years before.

Beautiful is the story of the family-life, with the generous, warm-hearted mother, who always kept close to her children's hearts, and of the work of the devoted daughter, which at last brought prosperity to all the family and gave the philosopher a serene, and comfortable old age.

Mr. Alcott has been called vain and egotistic, but I think he never felt a keener thrill of pride than when he was welcomed in Western schools as the "Grandfather of Little Women."

In his quiet retreat he reviewed the old traditions from which he had separated in his youth, and found meaning and sweetness in much that he had then cast aside. This broad catholicity was misunderstood, and it was often reported that he had

changed his views and joined some exclusive church. But he took no backward step! It was remarkable that with his high standard of thought, his elevation of feeling, his love for order and beauty and handsomeness, which sometimes gave a touch of high breeding, which some would call aristocratic to his manners and surroundings, he never fell into a reactionary spirit, he never lost faith in the heart of mankind. If he believed in a government of the best, he judged of the best by no conventional standards. If his heart yearned for communion with his fellows, he did not purchase the delight by any sacrifice of his own allegiance to truth. But he did love a recipient soul to whom he could express his own thought. And he gained from a sympathy, which was not always accompanied by intellectual comprehension.

The charm of his manners, the sweetness of his disposition, the tenderness of his feelings, and the warmth of his friendships are well portrayed by Mr. Sanborn, who touches his little foibles lightly, only making them serve to bring out his individuality. He also presents a great deal of collateral information about persons and contemporary events, which will have value for lovers of curiosities in literature, but which sometimes impedes the flow and clearness of the narrative.

To Mr. Harris was committed the task, which no other could do so well, of presenting his philosophic ideas in logical order and showing their relation to the systems of preceding thinkers.

Mr. Harris finds Mr. Alcott to be an original thinker of great power, who by his own inward perception of spiritual truths reached the same doctrines which were held by the Neo-Platonists. He was not learned by the scholastic standard, but he absorbed the thought of the writers to whom he was attracted and blended it with his own spiritual life. Mr. Harris reveals a sequence and consistency in his philosophy, which a less acute reader might not easily find.

All Mr. Alcott's theories cluster about the lapse or fall of man from a state of original purity, and he finds the meaning of human life in an effort to return to primitive holiness.

While his expression of this thought is peculiar to himself, one cannot but see how the influence of the Calvinistic theology all about him, (although his immediate connection was with the Episcopal church,) must have prepared his mind to accept this solution of the great problem of Evil.

I well remember an ardent discussion between him and William H. Channing (who was, of course, brought up under Unitarian influences, and who ardently accepted his uncle's views of the dignity of Human Nature), on the expression of Mr. Alcott that Jesus did not descend into the ordinary relations of humanity. "I protest that there is no descent," said Mr. Channing. With the doctrine of lapse naturally belonged the assertion of pre-existence and his views of Temperament and Fate. But Alcott does not narrow his doctrine of the Lapse to a historic sin of one individual, but strives to present it as a necessary basis to creation. He regards the whole series of the lower animals as produced by man and becoming

representatives of his good or evil desires and passions. His vegetarianism is based on his philosophy, more than on hygiene.

Mr. Harris says that at times Mr. Alcott seems to accept the theory of Evolution, but that he repudiates it as the first stage of creation and accepts it only as a moral struggle of conscious beings towards purity and a recovery of lost holiness.

In thus groping after a solution of the central question of the passage of the one into the many, he necessarily takes up many forms of thought and seems at times inconsistent, but it is noteworthy that he never becomes pessimistic in his views and never loses the wholesomeness and sweetness of feeling, which make life serene and beautiful.

The dark shadow of Calvinism is not able to shut out the light of Hope. If man is fallen, his face is again set heavenward, and Eternity of Life shuts out the possibility of Eternity of Hell.

It is useless to attempt to condense Mr. Harris's exposition of Mr. Alcott's thought, for he has done his work with such thoroughness and skill, that no one interested in the subject will be content without studying his own words. Differing, as he does, from Mr. Alcott's views, he gives them their full value and shows the part which his theory has played in the development of human thought.

"The Orphic Sayings," ridiculed by many and understood by few, readily yield up their meaning to Mr. Harris's analysis, and the peculiar use of language having become familiar to us, we read them with a perception of the extent of thought comprised in these few lines, and of their relation to each other.

The careful arrangement of his scales of mental powers is shown to be strictly logical and consistent with his theory.

While Mr. Alcott's want of literary skill has often prevented him from giving adequate expression to his theory, we recognise a commanding control of language in short passages, which are pregnant with meaning, like the text of unpreached sermons. Mr. Lowell's witticism is false, as satire usually is, when he says:

"A lamb among men,

"He goes to sure death when he goes to his pen."

This whole work is an extremely valuable representation of that important phase of the spiritual life of New England called Transcendentalism. Mr. Alcott may never be the teacher of the many directly, but he will be the source from which a few will draw wisdom which will pass into the common life. However succeeding times may regard him, he has had a powerful influence on many of the best minds of two generations.

Mr. Alcott himself would not be indifferent to the fact that the book is a handsome set of two volumes, well printed, with good reproductions of two different portraits of the philosopher, and a view of the Concord School of Philosophy.

* * *

Since writing the above, the last of Mr. Alcott's immediate family has passed away. Mrs. Anna B. Pratt, the oldest and last of his daughters, had just returned

to Concord to make her home there for the rest of her days. She was soon after laid in Sleepy Hollow beside her parents and sisters.

She was the Meg of the famous "Little Women" and possessed in reality all those amiable and excellent qualities which are there attributed to her. Calm in temper, retiring in disposition, affectionate and sweet in character, she resembled her father more than the other children. Justice has hardly been done to her intellectual abilities, which were thrown in the shade by the brilliant achievements of her sister. But she possessed the same vivid dramatic talent, and was a charming story teller, and sometimes her stories were mistaken for her sister's. She had not the ambition and intense energy which Louisa possessed, or circumstances did not bring them out. Marrying early—she was protected for a time from the terrible pressure of need which weighed upon the family, and when left a widow her heart and mind were engrossed with the care and education of her children.

The sad infirmity of deafness prevented her from enjoying fully the social life for which she was otherwise fitted. But she has left behind her a fragrant memory of loving affection and kind deeds in the hearts of all who knew her, and who will always remember her as one of that unique family who have done so much to bless our New England homes, and hold them to "Plain living and high thinking."

Two sons survive her, who are both connected with the enterprising firm of Roberts Brothers, to whom the public are indebted for recognising the worth of Louisa Alcott's work, and publishing it in fitting form.

E. D. C.

LA RECHERCHE DE L'UNITÉ. By *E. de Roberty*. Paris : Felix Alcan. 1893.

M. Roberty's "Recherche de l'Unité" is a strange and baffling book which few readers will have the patience to appreciate at its true value. The essay is essentially a critique of the abuse of scholastic abstractions in contemporary philosophising. But the protest against abstractions is couched in so severely abstract a style that it is difficult to seize the author's thought and still more difficult to restate it fairly in simpler and more concrete language.

Rational or experimental monism is the label which M. Roberty affixes to his own doctrine. He opposes it, first, to all forms of confessed dualism, and, second, to the latent dualism which he finds lurking in neo-Kantianism, in Spencer's transfigured realism and in other contemporary forms of transcendental monism.

In his plea for monism he is traversing familiar ground and offers the reader little that is positively new. The monistic thesis can never be proved in the strict sense of the word. The dualist may always affirm, if he will, that for him the universe of experience is a product of two or more ultimate and irreducible factors that have no common divisor. And this view has been maintained by many great thinkers as the only doctrine which affords satisfaction to certain imperious demands of the human heart. However that may be, there are certain equally imperious instincts of the analytic intelligence which it leaves unsatisfied. "La raison sans cesse raisonne," and refuses to pause at any arbitrary barrier. The philosophising

intellect chafes at limits even though they be set far beyond the bonds of any probable advance of the science of our day. Where science proves unable to exhibit the unity, that is the causal interrelations, of two sets of phenomena, the philosopher postulates this unity by subsuming them both under a common logical category. And this postulated logical unity he submits to the investigator as a problem to be worked out in the symbols of mathematical physics. Nothing less than the subsumption of all experience under a single unifying category will satisfy him. And this instinct dualism baffles and disappoints. So that to this type of mind dualism presents itself not as one erroneous system of philosophy, but as an utter negation of all philosophy.

I do not know whether M. Roberty would formally assent to this statement of the monistic position, but he seems to say very much the same thing himself in his final résumé : "The rational monism of science and philosophy thus presents itself "as a psychical or even psycho-physical necessity, an imperious want which our "faculties are impelled to appease precisely because they feel themselves lost in the "chaos of our sensations at first and afterwards of our knowledge. We are unceas- "ingly preoccupied by the desire to arrest or dominate the dispersion of our intelli- "gence in the surrounding medium. This end is subserved by the ideal integra- "tion," etc., etc., p. 205.

The reader will find more that is new in the author's polemic against the latent dualism of what he calls transcendental monism. Under this name M. Roberty comprehends all systems which assume an antithesis between phenomena as a whole and a dark background or source of phenomena, variously denominated as the noumenon, the thing in itself, or the Unknowable. His argument is in substance a restatement of the familiar dilemma, as old as Plato. If it is really unknowable how can one even speak of it without self-contradiction ? But in his ingenious development of this argument, M. Roberty brings into due prominence and provides with a convenient technical name a valuable logical truth,—his so-called law of the "identity of hyperabstract contraries." The name suggests unfortunate associations. But M. Roberty's law has nothing but the name in common with its Hegelian namesake. The Hegelian identity of contraries is in the main a barefaced logical equivocation arising out of the elementary psychological fact of the tendency of our minds to associate opposites. But the law here considered applies only to the widest and hence emptiest abstractions, the *summa genera* of abstraction and generalisation. As we proceed upward by successive inclusions from the lowest species to the highest genus, we assume at each stage in the process a negative idea corresponding to each positive class-notion. The ideas "not-man" and "not-animal" have as real if not, as expressly defined, a content as the positive ideas man and animal. This is as old as Plato. But our author points out further that when proceeding upward along any line of generalisation the mind attains to the highest conceivable abstraction (the term of maximum extension and minimum intension) then this formal antithesis of positive and negative loses all its real content. The nega-

tive term answering to such a *summum genus* is a mere *status voci* devoid of all real significance. Plato long ago showed this in the case of the idea of (absolute) "not-being" which he dismisses in the Sophist as a futile and self-contradictory expression. But M. Roberty affirms that any abstract term which symbolises the totality of experience or phenomena is identical with any other abstraction that has the same extension even though the one may be in form the contradictory opposite of the other. Thus the ideas of matter, and of space void of matter, are *summa genera*, in terms of either of which the relations of all phenomena may be stated. The difference is merely in the point of view as appears from the Cartesian identification of matter with extension. We fall into illusion if we posit both concepts as coexisting realities and so double the phenomena. And the same holds true of the correlated concepts mind and matter, and subject and object. Hence arises the *summa delusio*, as our author calls it, of the three representative schools of contemporary thought, the Kantian criticism, the agnostic positivism and the Spencerian evolutionism. Differing superficially, they are one in this fundamental error, that they set up as a real antithesis the purely verbal opposition between the world and its cause or ground, between phenomena and that which manifests itself in phenomena, between the knowable and the unknowable. These terms are all ultimate, universal, all-embracing abstractions, and therefore exactly identical in respect of their real content. The world and its cause are the same indefinite totality of experiences viewed from different angles of observation. The *natura naturata*, to borrow Spinoza's phrase, and the *natura naturans* are not numerically distinct. The noumenon is merely the phenomenon thought of in a different way. The sum total of now unknowable things is identical with the sum of things potentially knowable. "*Summa tamen omnia constant.*" We add nothing to reality by erecting altars to our own personified ignorance.

Such in substance is M. Roberty's argument, and I have nothing to object to it here. I can only wonder at the significance he attributes to the entire question. His doctrine, though he may repudiate the label, is essentially pure phenomenism or positivism. His monism is less a positive conception than a negation of the dualism that would seem to oppose arbitrary barriers to human inquiry. His position is really that of the sceptic who through metaphysic has become dead to metaphysic. By the whole tenor of his psychology he is bound to regard abstractions as merely so many counters for the more convenient reckoning of the concrete values of life. Why should he attach so much importance to right or wrong manipulation of those counters on the metaphysical chess-board in matters which at present do not touch those realities very nearly? Like George Henry Lewes, he began with the credo of positivism. And, as happened with Lewes, his maturer thought is impatient of the seeming implication in all the divers forms of positivist agnosticism of an unknowable absolute beyond the knowable relative. The hint of a mystery, the dogmatic affirmation of a limit to human knowledge irritates and is distasteful to him. And I grant him that the doctrine, whether in its Spencerian or Kantian form

is as self-contradictory as the old neo-Platonist Damascius found it 1400 years ago. But what difference does it make to a philosopher who has transcended it? Is the religion of the Unknowable a serious danger to the moral life of modern man? Is the slight survival of this mysticism in the philosophies of a Wundt, a Spencer, or a Riehl a hindrance to concrete scientific progress? Many of the most vigorous leaders of modern thought answer these questions in the affirmative, and they may be right; *que scais-je?*

In thus endeavoring to expound the author's central thought, I have been forced to pass by the many interesting psychological *aperçus* which his book contains.

Especially noteworthy is the suggestion that the images or mental representations which the traditional psychology places between sensations and concepts arise frequently, if not normally, from a fusion of several elementary concepts and are not to be thought of always as direct copies of sensation. It was doubtless a feeling of this that led Plato in the Philebus to describe the imagination under the figure of an artist who paints the ideas which first arise in our minds as discourses of reason (*λόγοι*).

PAUL SHOREY.

THE SCIENCE OF MECHANICS. By Dr. Ernst Mach, Professor of Physics in the University of Prague. Translated from the Second German Edition by Thomas J. McCormack. Chicago: The Open Court Publishing Company. 1893. Pages, 534. Price, \$2.50.

"The present volume is not a treatise upon the application of the principles of mechanics. Its aim is to clear up ideas, expose the real significance of the matter, and get rid of metaphysical obscurities. The little mathematics it contains is merely secondary to this purpose."

These are the opening words of the Preface of this work, which is essentially a treatise on the *evolution* of mechanics, and not a text-book of its principles, all the problems that have arisen in the science's development being dealt with historically and from the point of view of the theory of knowledge. In this sense it is as much a contribution to philosophy as to science, and will thus be of much more value to the student and inquirer than a simple statement of technical principles could be. In Professor Mach's analysis the reader sees how the principles of mechanics have in fact been *ascertained*, from what sources they take their origin, and what their *positive* and *physical* essence is, as distinguished from the technical guise they have historically assumed and which students now so often regard as their real substance.

The gist and kernel of mechanical ideas has, in almost every case, grown up in the investigation of very simple and special cases of mechanical processes. It is these cases with which Professor Mach deals. Here we see the science in its genesis, and feel the steps by which it has been created. We accompany the great investigators in their deepest quests, meet the same obstacles, and experience the same doubts as they; learning that they, too, were mortal men, who had to hew their

way through the same difficulties as we, in the solution of our problems. In this way, we follow the trains of thought of Archimedes, Stevinus, Galileo, Huygens, Newton, and Lagrange, and participate in the making of their great discoveries. Thus, we live over in our souls their intellectual lives.

The confidence and strength which we gain for our own labors in such work cannot be overestimated. No one can come away from the perusal of this book without being intellectually and spiritually bettered, or without having won a taste for employment with high thought and classical knowledge which will always profit him.

The parts of the work of greatest import to those interested in physics are, the sections on the development of statics and dynamics, the discussions of the foundations of dynamics, the criticism of Newton's views, the substitution of newly formulated and more logical principles for the Newtonian axioms and definitions, and the chapter on the "Formal Development of Mechanics." To the philosopher all is of equal interest, as he may here see the way in which a complete and perfected science has actually been developed, and thus have the opportunity, in constructing his theory of knowledge of adhering to facts.

The general reader's interest will probably be fastened with the two sections in Chapter V: "Theological, Animistic, and Mystical Points of View in Mechanics," and "The Economy of Science." In the first we read of the religious opinions of the great inquirers, of their struggles with their inborn theological ideas, (or rather of the struggles of these ideas with new and irreconcilable opponent-ideas,) and of the way in which science has always been tinged with religious, spiritualistic, and mythological conceptions.

In the section on "The Economy of Science" is contained, in succinctest form, the groundwork of Professor Mach's philosophy. In his view, all science is economy of thought. Economy of thought—the saving of mental time and labor—is the object of language, arithmetic, algebra, of all concepts, and of science generally. All this is illustrated by a brief discussion of arithmetical and algebraical rules, the theory of determinants, calculating machines, the laws of physics, and space of many dimensions. By the light of this theory the reader will understand many problems of abstract physics which were before obscure to him.

No pains have been spared in the mechanical execution of the work, or in insuring correctness of translation. The proofs of the translation were read by Professor Mach himself, and also by Mr. C. S. Peirce, who edited the division "Mechanics" in the *Century Dictionary*. Mr. Peirce has also independently supplied a few paragraphs on the measures and weights of this country and Great Britain. The book is exhaustively indexed, and at the sides of the pages marginal analyses of the paragraphs are printed. Of the two hundred and fifty cuts and illustrations which the work contains, all have been redrawn with the exception of the fac-similes of old originals, of which there are a number.

LEITFADEN DER PHYSIOLOGISCHEN PSYCHOLOGIE IN FÜNFZEHN VORLESUNGEN. By Prof. Dr. Th. Ziehen. Jena: Gustav Fischer. 1893.

The second edition of Professor Ziehen's *Leitfaden* contains some additions and emendations, and, we are glad to say, an index; but, upon the whole, the text has remained unaltered. We have reviewed this book in a former issue of *The Monist*, Vol. II, No. 3, page 461. Ziehen is an antagonist of Wundt's, but it is to be regretted that his criticisms are based upon a misconception of Wundt's theory of apperception.

KPC.

LOGIK. Eine Untersuchung der Prinzipien der Erkenntniss und der Methoden wissenschaftlicher Forschung. By Wilhelm Wundt. Erster Band. Erkenntnisslehre. Zweite umgearbeitete Auflage. Stuttgart: Ferdinand Enke. 1893.

The first edition of this work of the well-known Leipsic professor appeared in 1883 in two volumes, entitled, respectively, *Erkenntnisslehre* and *Methodenlehre*. Of the present edition only this, the first volume, has as yet appeared. The volume is a large one, containing six hundred and fifty-one pages; its great size being due to the fact that Professor Wundt has a very comprehensive conception of logic—one coextensive, almost, with the entire field of general philosophy. We shall review this work exhaustively in a later number and will only mention here that Professor Wundt's point of view is not that of the traditional school, but, in contradistinction to the Aristotelian methods, professes to supply rules for the conduct of real research and means for the acquisition of new truth.

μκρ.

LA VUE PLASTIQUE FONCTION DE L'ÉCORCE CÉRÉBRALE. Par Georges Hirth. Traduit de l'allemand par Lucien Arréat. Paris: Félix Alcan. 1893.

A review of the predecessor of this work, *La physiologie de l'art*, appeared in Volume III, No. 1, page 143, of *The Monist*, to which we must refer the reader for the foundations of the theory of the present work. Its translator is M. Lucien Arréat, the accomplished correspondent of *The Monist*, who has performed his task with correctness and felicity.

It is a well-known fact that our judgment of the extension, and especially of the depth, of bodies is an interpretation of planar figures. We do not see things stereometrically; that is, we do not see solid objects as solid; but we see "plastically"; that is, we see things by means of fictitious or shapen images of them.

This problem of plastic vision has occupied investigators from the very beginning of science, and countless theories have been set up to explain it. The most recent ones are, that which regards the connexion of impressions with exterior objects as the effect of our innate concept of causality (Schopenhauer); that of projection (the mathematico-optical theory); that by which plastic vision is explained as due to the collateral confirmation of the other senses; that which, like the former, claims that the corporeality of things is the product of constructive imagina-

tion ; and, finally, that which defines sensory experience in this respect as a motor memory, making our faculty of measuring with the eyes the result of innumerable movements of the eye, which movements have gradually endowed the organism with such a delicate sense of muscular innervation, that even without executing these movements we obtain, by simple presentiment, images more or less distinct of depth, and so forth.

As opposed to all these various hypotheses, the theory of the author is, that plastic vision is a function of the cerebral cortex. And, in contrast also to the former methods, which were chiefly mathematical and metaphysical, his is physiological.

In a sense, his results are a modification of the nativistic theory. In the *original* formation of the faculty of plastic vision, indeed, the effect of experience is not denied, but this influence, it is contended, is one which must be sought rather in the primitive experience of the race than in the individual.

Plastic luminous sensations, he claims, cannot by any possibility be effected without an innate nervous organisation adapted to such production. Plastic vision, in one of its aspects, is a cerebral necessity ; it is not effected directly by the real figures of objects, or by their actual position in space, or by their binocular projection and perspective on the retina, but by the independent action of central luminous excitations, which owe their origin to certain properties of the surfaces of bodies, and which constitute, thus, a central constraint. The result of this is, (as is also the fact,) that we are subject to *necessary* plastic representations, even when experience tells us that we have not before us bodies possessed of actual properties of relief, as in the stereoscope, and so forth. Our organ is thus *constrained* to acquiesce in many illusions concerning the corporeality of nature.

Plastic vision, in fine, is not a linear-perspective vision endowed with stereometric projections ; it does not measure angles or parallaxes ; but simply has *sensations* more or less strong for the qualities of remoteness and for the relative extent of lights projected from the two retinas into the visual spheres and there fused.

Lights, which are both correspondent by their position on the two retinas and homologous with respect to energy of specific color, fuse in the elements of perception of the visual spheres, not by reason of a common fixation or the intuitive activities of the understanding, but in virtue of a dynamical constraint. Binocular fixation, clear vision, the convergence of the eyes, and so forth, are simply concomitant phenomena and more or less indispensable means of this "confluence" ; they are not its original cause.

The central constraint which is due to this "confluence" of homologous lights explains many of the mooted points of vision. All phenomena accompanied by adaptation of the visual organ, claims the author, are explainable from our simple feelings of the qualities of remoteness of light, which alone is sufficient to set in motion the mechanism of adaptation.

Plastic vision, in its origin, before the influence of collateral memory-images

and their associations, is the simple evolutionary product of luminous excitations, which contain *implicate* the elements for the judgment of distance; as a developed faculty, it is a central innervation, the active expression of our feeling for the qualities of remoteness of light. This is the core of the theory. μρκ.

UEBER HYPNOTISCHE EXPERIMENTE. By Professor R. von Krafft-Ebing. Stuttgart: Ferdinand Enke. 1893.

NATURGESCHICHTE DES VERBRECHERS. By H. Kurella. Stuttgart: Ferdinand Enke. 1893.

DAS GEFÜHL. EINE PSYCHOLOGISCHE UNTERSUCHUNG. By Prof. Theobald Ziegler. Stuttgart: Göschen. 1893.

The putative discovery of Krafft-Ebing that persons exist who by hypnotism can be put back into early periods of their life, so that, for example, a person thirty years old may be suddenly made to feel and to conduct himself as he did in his seventh year, is one fraught with great consequences, and has been much discussed of late in the press of Germany. As was to be expected, it met with much critical opposition, and among its foremost assailants, of scientific reputation, were Professors Ganster and Benedikt, the Vienna colleagues of Professor Krafft-Ebing. Benedikt went so far as to pronounce the whole matter a stupid humbug, and declared that Krafft-Ebing had been made the victim of his own credulity and been basely imposed upon by a designing hysterical person. It was to be expected that the celebrated Vienna psychiatrist, who thus saw his reputation endangered, would soon put forth an answer to these attacks, and the present tract is the result. It bears the motto, "Unlimited doubt as much the offspring of mental impotence as unlimited credulity," and contains in addition to its accurate presentation of the subject under discussion a sharp criticism of the strictures of his opponents, and especially of the animadversions of Benedikt. In keen psychological analysis it surpasses other books of its class, and may be cordially recommended to the readers of *The Monist* —a recommendation which the high reputation of its author almost makes superfluous.

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The second of the books listed at the head of this review is by H. Kurella, the author of the pamphlet on Lombroso, mentioned at page 640 of the last *Monist*. The present work of Kurella is quite extensive and supplies all the data necessary for a general study of the modern doctrines of criminology. It is an elaboration of all the previous literature of this subject, together with the author's original researches. After an introduction, Kurella treats of the abnormal anatomical features of the criminal, the biology and biological factors of the criminal, the psychology of the criminal, and finally of theories and applications.

In the chapter on the psychology of the criminal Kurella first portrays for us symptomatically the features of the criminal mind as this latter has been observed

by Lombroso and his school, and then proceeds to his elucidation, the chief result of which is the opinion that the main defect of the habitual criminal is his lack of moral sense. Of course, this is not a very remarkable conclusion, for what is in real need of explanation is the foundation and origin of this lack of ethical sense. Lombroso, following the precedent of Prichard, assumes in the normal man a moral faculty, an organ, as it were, of morality, which in the criminal is supposed to be wanting. This theory is, of course, untenable, for many reasons; and is also rejected by Kurella, without his substituting, however, any competent explanation in its place. Kurella seeks the key to the mysteries of criminal psychology in the study of the emotions, which in its present imperfect form is, nevertheless, not quite capable of supplying an explanation of criminal traits. In Kurella's opinion, the doctrine of emotions in recent years has been unduly forced into the background. He remarks in this connexion: "Unfortunately, it cannot be said that 'the theory of the emotions and of the pathological phenomena of the emotional sphere stands in the foreground of modern research. The analysis of the sensations and of perceptive images and movements dominates so completely the energies of modern psychology, and the localisation studies of cerebral pathology so completely absorb the interests of psychiatry, that the emotions are hardly treated at all, and investigators are even inclined to smother the voices of these trouble-some disturbers of the nicely ordered relations of localised ideas."

So far as we can see, the complaint of Kurella is justified, although very recently a work has appeared in France which, despite its many failings in psychological respects, will contribute much to the advancement of the theory of emotions,—namely Férd's *Pathology of the Emotions*. The reason the investigation of the nature of the emotions especially, and, we may add, of affective life generally, has been so neglected in our day is to be sought in the preponderantly experimental character which psychology has recently taken on, and which is not adapted to the conquest of this domain. But it is also to be sought, as Professor Theobald Ziegler remarks, (in the third book mentioned at the head of this review,) in the *philosophical* tendency of the present day.

With Kant, the interest of reason is predominant; in the veins of the cognising subject, as he constructed it, says Dilthey, not real blood, but the impoverished fluid of reason, as pure intellectual activity, courses. The panlogism of Hegel, despite its fine sense for religious and æsthetic questions, was never quite able to do full justice to the emotional side of psychic life. The philosophy of Herbart, on the other hand, whose chief forte was psychology, also was unable, with its mechanism of representation in which it dissolved all mental life, to supply a competent explanation of the emotions; despite the valuable treatises of Robert Zimmermann and Joseph von Nahlowsky. In Schopenhauer's metaphysics of the will, emotional life met with scarcely any treatment, despite the strongly emotional background of this philosopher's pessimism. And in the case of Wundt it is to be seen how, owing to the influence of a metaphysical doctrine of the will, precisely the

emotions were curtailed in treatment, although here there was present the counterpoise of keen and careful psychological presentation.

We cannot, however, ascribe to Ziegler's book a place among the more important works on this subject. In point of fact, it is not the author's intention to offer anything new, but rather to give a summary of the old, and contrast it with modern tendencies of research. It cannot be said that this has been well done, though the book possesses withal a high value in the general survey which it gives of the subject. It might have been made more useful by greater uniformity of treatment; the author alternately talking in a popular and rigorously scientific tone, and indulging in many digressions.

Very exact knowledge of the nature of the emotions will exert a great influence on pedagogy, especially on that branch of it which takes up with the results of psychology; and wherever pathological phenomena in this field are treated, pedagogic pathology may hope to derive advantage from it. In this connexion it will not be out of place to refer to two tracts recently published by W. Bertelsmann of Gütersloh—one by W. Trüper, of Jena, on the pedagogical application of Koch's doctrine of the psychopathical minor factors, entitled *Ueber die Errichtung psychopathischer Minderwertigkeiten*; and the other by G. Közle, entitled *Die pädagogische Pathologie im neunzehnten Jahrhundert*, which is a synopsis of all that has appeared in Germany on pedagogical pathology since the beginning of the century, though not including the medical side of the science.

C. U.

We have received from M. George Mouret a reply to the criticisms of Mr. F. C. Russell, published in Vol. III, No. 2, of *The Monist* in the article "Logic as Relation Lore." To our regret, M. Mouret's article has been crowded out of the present number of *The Monist*, but will be published in a subsequent one. We also wish to state that the author of the article "Meaning and Metaphor" in the last number of *The Monist* is "The Hon. Lady Welby," not "Lady Victoria Welby."

PERIODICALS.

ZEITSCHRIFT FÜR PSYCHOLOGIE UND PHYSIOLOGIE DER SINNESORGANE. Vol. V. Nos. 5.

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DIE RELIGION DER WISSENSCHAFT. Eine Skizze aus dem philosophischen Leben Nordamerikas. By *Paul Carus*.—EIN UNAUFGEKLÄRTES MOMENT IN DER KANTISCHEN PHILOSOPHIE. By *Robert Hoar*.—WERKE ZUR PHILOSOPHIE DER GESCHICHTE UND DES SOCIALEN LEBENS. (Vierter Artikel: *Gabriel Tarde*, Les lois de l'imitation.) By *F. Tönnies*.—LITTERATURBERICHT. (Berlin: Dr. R. Salinger.)

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